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Sewage Disposal Plans of Atlanta, Ga.

By W. T. Waters, Atlanta, Ga.

ATLANTA, GA., a rapidly growing city of 155,000 people, ranking second to New Orleans among the largest cities of the cotton-growing states, has just begun the installation of its first sewage disposal system. Over 16,000,000 gallons daily flow of sewage, now dumped in its raw state into several small streams flowing away from the center of the city in all directions, will be treated by this process. Atlanta is six miles from the Chattahoochee river, a non-navigable stream at this point. All the sewage finds it way into that river, which constitutes the sole water supply of several cities and towns below Atlanta toward the gulf.

The process which Atlanta will install embodies the Imhoff tank, of which little is known in this country. The Imhoff tank has been installed at Batavia, N. Y. Atlanta is the first large city in America to use it. The Cameron Septic Tank Company have notified the city that the proposed plants constitute an infringement of their own plant. They have ignored the Imhoff patent. They claim their usual royalty. Atlanta is therefore in the role of a pioneer in two fields—first, the demonstration of the Imhoff patent, and also the defense of that patent as valid and independent of the Cameron process.

Atlanta's proposed sewage disposal system will be necessarily, because of the topography of the city, divided into three widely separated plants, into each of which the flow of several trunk sewers will be directed, intercepting sewers being used to extend the flow of those trunks from their present mouths to the plants beyond the outskirts of the city. Each of the disposal plants will use the same principle of treatment.

The money for the construction of these disposal plants is part of a $3,000,000 bond issue which the city voted in February, 1910. The issue was won after a hard campaign under the Georgia law, which requires the favor of two-thirds of those who cast their ballots. In it provision was made for the extension of the city water system, for new school equipment, for a hospital addition, for crematories, and for sewers. Each of these issues was voted upon separately, and all passed. The sewers' share was $1,350,000, divided as follows: $528,900 for three purification works; $545,230 for ten intercepting sewers; $100,000 for thirteen lateral trunk sewers (to relieve congestion on main trunk lines now existing); $175,870 for contingencies and engineering, and $100,000 for an auxiliary trunk sewer.

At the date of the bond election, there were 239 miles of streets in Atlanta without house sewers, and 11,600 homes without sewer facilities. The city had just taken in a great deal of contiguous territory and had thereby more than doubled its area to 26 miles. The old territory was bad enough, but the new territory added just so much more to the undeveloped portion of the city. Atlanta had already outgrown herself before the annexation. The rapidity of her growth theretofore and the fact that her tax is $1.25 (reduced from $1.50 in 1896) on a 60 per cent. valuation, the lowest in a long list of large cities, were together responsible for the condition which the annexation made worse.

Till the bond issue was voted, Atlanta had made no provision whatever for the treatment of her sewage. Always the raw matter had been dumped into the streams radiating from the central crown of the city. In the late '70's a few private sewer systems were put in by companies owning downtown hotels and buildings. The first public system was not begun till the middle '80s, when Rudolph Her-

ing, of New York, still the city's consulting engineer, laid out the system which has been followed since. The first departure from that system is being made under the new work now in progress. The existing sewer system is on the combination plan, carrying sewage and surface drainage. All extensions of it are on the separate system, one sewer for surface drainage and another for sewage. The drainage water will be discharged directly into the streams at the most convenient points. The house sewage will flow into the trunk sewers from such territory as lies above the ends of those and into the intercepting sewers from the territory beyond the outlets. The prohibitive cost of further extending the ten main trunk sewers, which are of brick construction and beyond the outfalls of which the city has long since grown, was a potential argument for the decision to cease the construction of combination sewers.

After the present projected plants and connections are completed, all of the small streams now used will carry surface water at all times, and will carry the diluted sewage emptied into the main trunks in time of heavy rain. The treated sewage below the disposal plants will still go into the Chattahoochee river.

The three disposal plants are designated locally as the Peachtree plant, serving the northern portion of the city; the Proctor creek plant, serving the western and southwestern portions, and the Intrenchment creek plant, serving the southeastern portion. It has been found practicable to convey the discharge of all save one of the present trunk sewers to their respective disposal plants. The one exception is called the McDaniel street outfall, which will have to be pumped to either the Proctor creek plant or the Intrenchment creek plant. There is a possibility that the city may investigate the electrolytic process for separately treating the discharge at this outfall. The extreme northeastern portion of the city, built in the sump of a plateau, is another problem still unsolved, which confronts the city authorities. A separate system and disposal plant may be necessary for this section. In all other respects than these mentioned, the plans for the city's new sewage system are clear cut and definite. They were drawn up under the supervision of Rudolph Hering, the same engineer who laid out the original system of sewage removal.

The discharge from three outfalls (and possibly four, if the McDaniel street outfall is included) will be conveyed to the Proctor creek plant at a cost of $107,990 for the three. The McDaniel street outfall was included in the group of four outfalls directed to the Intrenchment creek plant in the bond issue estimates, the four to cost $163,240 for the necessary intercepting sewers. And the discharge of three outfalls will be conveyed to the Peachtree plant at a cost of $274,000.

There has been some little difficulty encountered by the city authorities in securing right of way for the intercepting sewers to the Peachtree plant, but this opposition has been practically overcome by tactful and diplomatic dealing with the interposing landowners. Some slight similar opposition was met in the securing of rights of way to the other plants, but amounted to even less. No drastic action in any case has been found necessary as yet.

On December 12 bids had just been opened for the construction of the Peachtree plant, but the ensuing computations became so involved and complicated that three days after the inspection of the bids the successful contractor had not yet been announced.

Bids for the Proctor creek plant were opened on November 22, and the contract was awarded to the Municipal Engineering and Construction Company, of Chattanooga, Tenn., for $95,686. This amount came under the bond issue appropriation for the plant, which was $103,255. Earlier bids had been rejected because they all exceeded the bond estimate, and these later bids were received on alternative propositions, the alternative on which the successful bid was made omitting half an acre of the acre and a half of sprinkling beds contemplated in the original plans. The omitted half acre will be built by the county convict forces for the city.

Space would forbid the separate detailing of the three disposal plants, which are planned to be substantially similar in the important particulars. The Proctor creek plant is typical of the two others, and a description of it will be sufficient here. Detailed plans and specifications of the other plants may be obtained from the city engineer of Atlanta.

Inasmuch as the Proctor creek plant has just been begun, any description of it is necessarily based on what it will be, under the specifications.

Atlanta's process will be, throughout

the three plants, to subject the raw sewage to sedimentation, the solids sinking through the Imhoff patent bottom to a decomposition chamber below, and the liquids passing on to the sprinkling filter beds. Periodically, at such intervals as experimentation with local conditions will determine, the sludge from the bottom of the decomposition chamber, that which has been in there longest, will be blown out to the sludge drying beds.

The system, in short, separates liquids and solids, and subjects the one to aerobic action and the other to anaerobic action. Seemingly, it attains the ideal toward which sanitarians have been striving, for it permits the treatment of each under the best conditions and without interference by the other.

In detail, the Proctor creek plant is to consist of a grit chamber of concrete, 17x18 feet, with a set of steel bar screens near the inlet end; a concrete preliminary settling tank of the Emscher type, consisting of a combination of 12 units; a revolving mechanical fine screen; two concrete dosing tanks; two broken-stone sprinkling filters, one of an acre and the other of half an acre superficial area; a broken-stone dyring bed, and a laboratory building.

The grit chamber consists of a screening compartment, three channels for the sedimentation of sewage, and a by-pass channel, the flow through which is controlled by means of stop planks; and an overflow chamber of brick masonry. The bottoms of the three channels are provided with drains of 6-inch vitrified tile. The screen is placed in a sloping position, the upper end being inclined inward.

The preliminary settling tanks, 12 in 1 unit, are of reinforced concrete, and are of the Emscher type(which embodies the Imhoff patent bottom). They are provided with channels through which the sewage can be passed in either direction through the upper portions, which form the settling chambers. The flow of sewage is through three tanks in a row, and the provision for its reversal is obviously wise, the purpose of that provision being to work all the tanks equally. The bottom partitions, which form the sludge chambers, are circular wells with conical bottoms. The heavier sewage drops down to the inclined bottom of the settling chamber, one lap of the bottom underlapping the other, and passes through the slot that this underlaps to the sludge chamber. The inclined and underlapped bottom of the settling tank is the essence of the Imhoff patent. The underlap closes the sludge chamber to all upward exit of gas bubbles, carrying sludge particles through the settling chamber to the top of the flow, and thus eliminates one of the greatest objections voted against the accepted form of so-called septic tanks. A gas vent pipe is provided to conduct the gases beyond the top of the upper flow.

It is in these settling tanks that the solids are separated from the liquids. The solids remain where they have settled, in the sludge chamber. The period of their stay there will be determined when the plants are put in operation. There they are subjected, without disturbance, light, or air, to anaerobic action. At the expiration of the proper interval a valve in the sludge exit is opened, and so much of the sludge on the bottom of the mass as has been there the required time will be forced out by the pressure above it.

Leaving the sludge chamber, the treated sludge goes to a sludge drying bed of 10,000 square feet area, where it is spread upon a bed of ¼-inch sand overlying 2 inches of broken stone. The stone is laid in three layers; 1 to 2½ inch size, 5 inches deep on bottom; ¼ to ¾ -inch for the next 5 inches, and the upper 2 inches of a size finer than ¼-inch and coarser than 1-16 inch. Upon this the sand is spread uniformly. Underdrains of 3-inch vitrified pipe, with an 8-inch pipe for the main underdrain, are provided. With this whole goes a sludge removal railway, 24-inch gauge, on steel cross ties within the banks of the slduge bed, and on wood ones beyond.

To return to the point where the liquid passes from the settling tanks: The liquid passes next to a mechanical self-cleaning fine screen, enclosed in a concrete chamber with a brick superstructure under a timber and slate roof. The screen is to be of a heavy and durable construction, equal in efficiency to the Weand cylindrical type. The screen cloth will have not less than 36 meshes per lineal inch, will be supported by a heavier screen, and will have a whole surface of not less than 150 square feet. The screen will be revolved by electric motors, the power being furnished by the local company that furnishes public power. The screen will be automatically cleaned, and the screenings will be discharged into a chamber provided. Stop planks are provided so that the

sewage may be diverted into a by-pass pipe at will.

Beyond the screen, the liquid passes to two concrete dosing tanks, operated separately, and each capable of dosing an acre of filter surface. The tanks are of the taper pattern, each with a reinforced concrete roof. In each there is a Miller or Merritt automatic 24-inch siphon, set so as to discharge the tanks under a head of 9 feet to 2½ inches above the sprinkling filter nozzles. Each is equipped with an automatic counter, numbering 10,000, to show the number of doses applied.

Next come the sprinkling filters, each of 1-acre area. They may be enlarged in number, as the needs of the plant demand, as may also the settling tanks. Only half of the second unit will be constructed for the present at the Proctor creek plant.

The walls of the sprinkling filter are of dry rubble masonry. The stones are to be squared roughly with a hammer to not less than 4 inches in thickness or 10 inches in either of the horizontal directions, and are to be laid so as to break joints and avoid spalls. The bottom is drained by ridges and valleys, and is ventilated through a false bottom and rising pipes equipped with revolving ventilators (like those on ships) and weather vanes at the top. Lateral distributers come into the filter underneath, of 6-inch vitrified pipe, laid carefully to grade in a bed of concrete and surrounded by concrete. The risers from tees in these lateral distributers are of lightweight cast-iron pipe. At the top of each riser is the sprinkler nozzle, of the Taylor or Weand type, discharging a spray or film of uniform intensity. The nozzles are 13 feet 6 inches apart in the lateral lines, and alternate on lines 11 feet 8 inches apart in longitudinal measurement.

This, briefly, is what the Proctor creek disposal plant is to be. The city engineer's estimate, based on present conditions, is that 3,185,568 gallons of sewage per 24 hours will flow into this plant. The Peachtree plant will be built to take care of 8,317,728 gallons daily flow immediately, and the Intrenchment creek plant will treat 5,077,096 gallons daily.

On November 25 the city attorney of Atlanta received from Dr. Karl Imhoff, patentee of the Emscher type of settling tank, a release from all claims for royalty. The release had been drawn up by the attorney, sent to Germany by Rudolph Hering, and returned through that gentleman. It was on Mr. Hering's word that he would secure the release that Atlanta proceeded with all her plans. The reason behind the release is said to be Dr. Imhoff's desire to see his patent demonstrated in America by a city of some size. The Cameron Septic Tank Company claims, however, that the city's proposed plants will infringe their patent, and have notified the city that it must either pay royalty or allow the plants to be built by them. On June 10, 1910, shortly after the plans for the city's disposal plants were made public, the mayor of Atlanta received from H. D. Wyllie, general manager of the Cameron Company at Chicago, a letter which read in part as follows: "We learn that the city of Atlanta is contemplating the construction of a sewage disposal plant that will involve an infringement of letters patent No. 624,423, issued Ooctober 3, 1899, to Donald Cameron and his fellow patentees." General Manager Wyllie proceeded to insist that the rights of the company's patent must be respected. "We are assured that the parties who are designing your plant,' he continued, know of the risk that you are incurring, and we therefore surmise that these parties have very probably offered you some sort of assurance of alleged protection." He minimized the value of those assurances. He stated the company's contention that its American patent is independent of the British patent, and does not expire till October 13, 1916.

The mayor was out of the city when this letter was received, and his secretary submitted the communication to the city engineer, who stated his opinion that the claim of infringement had no foundation. The secretary then inquired by letter of Hering and Fuller, New York, concerning the matter, and received the following reply, signed with the firm name: "Replying to your query of the 13th instant, addressed to Mr.. Hering, who is at present in Europe, we would say that if sewage disposal plants are constructed for the city of Atlanta in accordance with the plans and report submitted by Mr. Hering recently, there will be no infringement whatever of the Cameron patents. The use of the septic process is not contemplated in any of the designs which have recently been made in this office for any city." The secretary informed the Cameron Septic Tank Company that both the city engineer and Hering & Fuller decried its claims of infringement, and said "it is hardly

to be credited that he (Mr. Hering) would recommend to the city of Atlanta the adoption of a system covered by patents without having the city secure the patents right from the proper authority." On July 26 the mayor received a copy of the circular letter which the Cameron Company sent out, setting forth their claim that the life of their patent endures till 1916.

That was as far as the matter went until a citizen of Atlanta, who is interested in having the electrolytic process installed here, wrote to the Cameron Company as follows: "Atlanta is putting in a settling tank system of sewage disposal. It was first called 'septic tank' and afterward the name was changed to 'settling tanks.' The patentee is Dr. Imhoff, of Germany, and he offers to charge no royalty to the city of Atlanta. I beg leave to inquire if the settling and septic tanks are the same thing and both covered by your patents." This and the reply were given to the press. The reply, in part, was as follows: "The process claims of our patents cover any system of tanks in which putrefaction is systematicaly developed for the liquefaction of sewage solids, and notwithstanding Mr. Rudolph Hering's statements to the contrary, we are satisfied that the system proposed for the city of Atlanta clearly infringes our patent, and the city authorities have been so advised. * * * While Mr. Hering's firm does not hesitate to criticize the court's decision on purely legal questions, they would be the first to resent any criticism by the court of any decision of theirs involving engineering problems. Yours very truly, Cameron Septic Company. (Signed), H. D. Wyllie, General Manager."

That is as far as the matter of infringement has gone. The city authorities do not appear to be disturbed about it. They are relying wholly upon Mr. Hering, none of them having studied the question. They are busier building the plants than they are worrying over possibilities.

Hydro-Electric Practice

By H. A. von Schon, M. Am. Soc. C. E., Consulting Engineer, Detroit, Mich.

Principles of Design of Plant

THE United States Geological Survey department has gradually perfected a system of river flow measurements which now covers every river of any importance, and practically all those which represent water power opportunities. These operations are carried on along practical and not purely scientific lines and yield results which may be safely accepted as reflecting the true hydrographic conditions as near as they can be ascertained. River height gauges have now been established at several thousand stations; they are read twice daily by instructed observers and flow measurements are made at each station for different river heights during the year. From these gauge records and measurements the flow rating for the stream at the respective station is developed, which covers the entire range of its fluctuations. On all large rivers several such stations are maintained.

This system has now been in perfect condition since 1907, and since the last four years has contained an abnormally dry year for every section of the country, the required data to make a daily flow analysis of any river during a dry year are now available. If the point of the projected development is some distance up or downstream from one of these stations, the rating for the nearest may be taken and applied in ratio of the drainage area under consideration; and if no government observations have been made on the stream in question one is likely to be found in the same drainage basin on some other river, and the rating of this may be utilized with satisfactory results.

Parties who control water power sites would do well to establish a river gauge at some point where it will be safe against interference from floatage and arrange with some person to have the readings noted continuously every morning and night. These data will prove of great value when the engineering of the project is taken up.

The daily flow of the stream during a low precipitation year is tabulated as per the following partial record:

No. of Days	Gauge Height	Flow in c. f. s.	Aggregate of Days	Flow	Mean
8	1.2	550	8	4,400	550
12	1.35	600	20	11,600	580
20	1.60	650	40	24,600	601
45	1.75	700	85	56,100	660
60	2.30	850	145	107,100	738

From this it appears that 550 c. f s. was the lowest daily flow, and it prevailed during 8 days; 600 was the next during 12 days; 650 next for 20 days, and so forth. It shows the accumulated and mean flow for the daily units, and the completed table would give the total and mean for the entire year.

From such an analysis two basic facts regarding the available potential flow are deduced.

First, that the absolute continuous maximum is the daily mean of the annual total. This requires no argument, because it is a fact that two or more low precipitation years occur in sequence.

Second, that the feasible continuous maximum is the lowest daily mean plus any supplemental flow secured from storage or the equivalent of some auxiliary power supply.

The storage unit is the acre-foot. The acre equals 43,560 square feet; 24 hours contain 86,400 seconds, or about double the area, therefore one acre-foot (one foot deep) of water represents a continuous 24-hour flow of half a cubic second foot.

To supplement the low daily flow of 550 to that of the next higher of 600 requires a storage supplement from 50x8x2, or 800 acre feet, which may be a reservoir of any area and depth representing this total in acre feet of water. To raise the potential flow to the next higher daily calls for storage supply from 50x20x2, or 2,000 acre feet plus the previous 800, or of 2,800 acre feet, and so on. It requires about 13 c. f. s. to produce one electric horse power with one foot fall. If the potential fall is 50 feet, the difference between the lowest and next higher daily flow of 50 c. f. s. represents an output of 50/13x50, or 192 horse power; and that between the second and third lowest a similar quantity or a total of 384 horse power, which calls for a steam plant of about 425 horse power capacity. In this manner the daily flow table is analyzed until the output is reached which can be remuneratively marketed.

But the determination as to the potential flow basis for the development is yet far off, as the question of cost must make the final decision. How much storage can be secured, what is the cost of the needed land and reservoir works, how do the aggregate, fixed and operating charges of the storage investment compare with those of an auxiliary plant; these are the questions to be first settled. And settled they should be before the development is planned. If left to the future the enterprise need not be expected to represent the most resourceful utilization of the power source. Much more can be said of the flow determination, but space will not allow.

The available fall is not always found to lie on the surface. Many water power opportunities are capable of being developed by various programs which may conserve or waste this power factor, every foot of which is of great import to the final result. This is especially true of the low fall sources, which today represent the large majority of those yet undeveloped. The best solution of this problem must often consider the feasibility and promise of several different development programs in their final financial results of earning capacity. This requires a thorough engineering investigation, determining not only the fall in a given reach but also the slope upstream of it and the development of the future ponded areas, and a careful study of the influences of higher and flood stages by any of the proposed fall accumulations; also the preliminary designing of the required restraining and diversion works in order to clearly establish their influence upon the future regimen and control of the river's flow and the effective utilization of the greatest possible fall. While the flow determination calls for a careful analysis of existing data, that of the fall requires the matured judgment gained from varied experience in devising and applying the most resourceful of several feasible programs of developing the power.

When these potential factors of the power source have been wisely chosen, much remains to be done and every step taken brings opportunities to waste capital investment and earning capacity. If the development is to show the highest possible net annual surplus, the maintenance and operating charges must be the lowest obtainable. Shortsighted economy may reduce the first cost, but is likely to increase the charges beyond the interest item which the saving repre-

sents. And on the other hand, the economies of present day structural material and designs are most likely to insure the best final financial results.

The flow and fall determination practically fixes the outline of the development program and its scope, because the former must be decided to lead to a conclusive adoption of the latter, and it is rather the exception than rule that developments can be completed for a given scope progressively. At any rate the restraining works, dam, spillway, waste sluices, etc., are pertinent to even a partial first development; they are, or should be, designed to answer all future needs. In these safety with greatest economy is a rudimentary consideration; but others, such as flood and ice control, preventing sediment accumulations, accessibility for needed repairs, automatic in place of hand operations for controlling head and flow, disposal of floatage, etc., which are not always given proper attention and which will have a great final influence upon the economic efficiency of the plant. Many a Northern plant closes down yearly for a few days to weeks on account of ice interferences; in others silt accumulates in the upper pool, intake and diversion conduits, whereby their capacities are much reduced, and some find their operating head drowned out by high water. It is not presumed to state that all of these might be prevented, but it is a fact that provisions could often be made to guard against them, or at least greatly diminish their damaging effects.

The design of the dam must adapt itself to the characteristics of the stream as well as to those of the site. Much can be gained for the control of flood flow, ice, silt, etc., by the open dam type, in which the greatest portion of the natural channel area remains available during such periods, while their cost need not exceed that of the required solid masonry structure. Dam failures are chiefly due to two causes, insufficient foundation and non-adaptation to flood conditions, and both of these problems are much simplified in the open dam type. If diversion of the potential flow is a part of the program, the method chosen must be proven to be the most economical and efficient. Whether open conduit, flume or pipe line is the most favorable depends upon volume to be diverted, distance, location and climatic conditions. Many a pipe line is wasteful of head and expensive in maintenance cost. Canals on the other hand often cause a considerable loss to the flow.

The power station is the culmination of the development. Its proper location is all important. It should secure the freest influx and exit of the water, be easily accessible and be protected from flood rises, ice and floatage. In dimensions it should be ample for the moving in and out of any of the equipment, repair facilities and the safe separation of electric control apparatus and transformer installation from all other machinery. It should be fireproof and dry. For a direct development, when diversion is not a part of the program, the station location problem is the most troublesome. When at end of dam the storm overflow is likely to retard the tail water outflow and thus reduce the effective head, the advisability of creating some intake leading downstream from the dam should be thoroughly canvassed.

In many such cases the problem is most advantageously solved by the erection of a hollow concrete-steel gravity dam and placing the power station in its interior. This realizes the greatest obtainable ouput from the available power source and economizes in first cost of the plant. If the dam is safe the station in its interior is likewise so. Dampness may be entirely avoided by surrounding the interior station walls by an ample air space, and access and egress may be arranged for as conveniently as in a separate structure. Several of these spillway stations have now been erected and are fully coming up to all the advantages claimed for this type.

The generating equipment may be the means of turning an otherwise well planned development into financial failure. The engineer plans for eighty per cent. turbine efficiency, but how frequently is this realized? There are many water power installations yielding seventy and less, nor are these only of the old timers' class. Unfortunately the equipment question is not generally given the careful treatment which it should have. The unit selection should conform to the service to be rendered and, with this condition satisfied, should be chosen to yield the highest practicable speed. Head fluctuations should and can be met by the turbine design. Exciter units should, where feasible, be operated independently of the generator lines. There is much less difficulty with the electric than the hydraulic

equipment, as the modern apparatus is of uniformly high standard and efficiency.

This completes the hydro-electric generating plant. When plans and estimates are properly prepared the power output and its generating cost will be known and the value of the output, and therefore of the development, can then be determined. The capital investment covers the cost of the development, lands, franchises, legal and engineering services, interest to be paid during construction period and the discount in placing securities. Fixed charges are interest on investment, depreciation, and taxes. Operating charges are hire of personnel, maintenance and administration. The cost of the output follows by dividing the aggregate of all charges by the annual kilowatt hour yield. Any higher revenue than this represents surplus earned.

A normally conditioned water power opportunity can be developed to put the product on the market for half a cent and less per kilowatt hour, which for 300 days at 20 hours amounts to $30.00 per kilowatt, or $20.00 per horse power electric. There is no steam plant now in commission in this country which produces current at a lower cost, nor is this likely to be the case in the future, as the costs of steam plant and fuel are sure to advance constantly. A few large steam plants, of twenty thousand and larger output, produce seven-eighths of a cent current, while the best of five thousand kilowatt output do not produce current for less than one cent per kilowatt hour.

In closing this article of my series on hydro-electric topics, I quote the following Associated Press dispatch of recent date:

"Standing on a public platform in Berlin (Ontario) this afternoon, surrounded by members of his cabinet and facing an assemblage of about 8,000 people, Sir James P. Whitney, premier of Ontario, applied pressure to the ordinary electric button in a small piece of board. Instantly the twilight gloom of the building was transformed to the brightness of day by the light of tier upon tier of incandescent bulbs and arc lamps, fed by electric energy from the water of Niagara Falls, more than 100 miles away.

"Simultaneously there leaped to life in the streets of Berlin, in business places and private homes of the city, thousands of other bulbs fed from the same inexhaustible source.

"Simple as was the act of Ontario's premier, it marked the opening of the most important epoch in the history of the province, an epoch of increased industrial development. In pressing the button he formally inaugurated the supply of Niagara power to western Ontario under the present scheme of joint municipal ownership and government operation."

The significance of the advent of cheap electric current herein expressed for the industrial future welfare of our Northern neighbor is the same for many sections of our own country, especially for the Southern States, so bountifully blessed with economical hydro-power resources.

Comparison of Des Moines and Indianapolis Forms of Municipal Government

By Augustus Lynch Mason, Indianapolis, Ind.

THE so-called commission form of government is now under discussion in the city of Indianapolis. The charter of that city has long been a model, but, like all forms of city government which permit the use of the offices of the city to pay political debts, it is not altogether satisfactory when political manipulators are in control. Mr. Augustus L. Mason, who put the original Indianapolis charter into the form which it has retained through considerable change in detail, seldom for the better, comes to the defense of the Indianapolis form in a series of articles in a daily paper, from which the following extracts are made.—[EDITOR.

We may quickly state the fundamental difference between the charters of Indianapolis and Des Moines. It lies in a nut shell. The Indianapolis charter separates the legislative and executive powers, placing them in the hands of different officials. The Des Moines charter vests both executive and legislative power in the same officials. With us the council pos-

sesses the legislative power to pass ordinances, levy taxes and appropriate money. The mayor and his subordinates can spend the money thus appropriated only for the specific purposes determined by the council. The five commissioners at Des Moines do all these things. They decide upon the tax levy and appropriations and they expend the public revenues. They exercise all the powers of our council, mayor, controller, boards of public works, safety, health and parks.

This difference is the heart of the whole question. There are many other things, such as nonpartisan elections, civil service rules, the referendum, the recall, etc. These things may be good or bad. We can take them or leave them. They can all be used with our present plan of government. The only thing which is vital and fundamental is the union or separation of the taxing power and the spending power. Under our plan, the council holds the purse strings, and acts as a check upon the executive. Under the Des Moines plan the executive holds the purse strings. We have two keys to the public treasury. Des Moines has one. Which is the better? The answer can not be made absolutely as a matter of theory. It must also be sought in experience.

The practical question is, has our council, under the present charter, levied taxes which were too low? Has it appropriated too little money? Has the council held the purse strings too tightly? If so, then we have surrounded the taxing power with too many checks, and it should be placed, as at Des Moines, in the hands of the same men who spend the moneys raised by taxation.

Most taxpayers will be surprised to learn that this is exactly what is behind much of the present discontent with our city charter. The fact is that the executive side of our city government has complained for years of the restraints placed upon it by the city legislature. Not only have our city executives been impatient because of delay and reluctance in council appropriations, but in the no less important matter of borrowing money through the sale of bonds. Our mayors have had a hard time to get what they wanted from the council.

Almost as soon as the present charter became law, various interests began to show their belief that the council would not levy enough taxes nor appropriate enough money. First came the firemen's pension law, in which the state legislature required the council to levy a specific tax for firemen's pensions. Then came a similar law for police pensions. I believe the sinking fund law came next. The park law also required the council to make certain levies for park purposes, and the legislature from time to time made increases in the required amount of park tax levy. The argument made for the park boulevard law, with its system of local assessments, was that the council would not appropriate enough money for boulevards.

This displeasure with the restraints on the executive side of the government is characteristic of our times. One article in Mr. Roosevelt's new nationalism is "an impatience of legislative restrains on the executive." President Taft seemed to have the same feeling. At the convention of governors of the various states, President Taft, apparently having in view his troubles with congress, addressed them as, "My fellow-sufferers."

For my part, I distrust this tendency to break down the legislative side of government. I believe that it is a bad theory, and will prove bad in practice, if we revert to the old principle of city government, which was tried here for fifty years, before the adoption of the present charter. Those of us who were here then know that it worked disastrously. Each man of the council could get his own desired appropriation by voting for what the other fellows wanted. As the council committees spent the money, they did just what Judge Cardwell says the commissioners at Des Moines are doing, i. e., they practice the "I tickle you and you tickle me" policy.

Another illustration of the same body of officials exercising both legislative and executive powers is our board of county commissioners. The system worked well when the population was small, but is has proved expensive, inefficient and often corrupt in counties of large population and wealth. So disgraceful was the condition of finances in our larger counties that, a dozen years ago, it was found necessary to take from county commissioners the power of levying taxes and appropriating money, and to vest it in a separate body, the county council, as a check on the commissioners. At the same time a law drafted by A. C. Harris, to check the state-wide scandals in township business, was passed, taking the taxing power from township trustees and vesting it in township advisory boards. Of course, all this machinery would be unnecessary if only good, able, honest

business men were elected to office. Such men need few checks. But it is a sound principle that power is always liable to abuse. Laws must be framed in the expectation that incompetent and dishonest men will sometimes get into office. The separation of the taxing from the spending power is the greatest instrument that I know of for calling public attention to the conduct of public business. The very friction between two sides of government advises the people what is going on. It lays the basis for uncovering extravagance and rascality. To unite these two government powers in the hands of the same persons is to encourage secrecy, keep the people in the dark and take their attention off of public affairs. The very agitation and public discussion of city affairs under our present charter, so far from condemning it, is one of its chief merits. It has done much to encourage the citizen to be critical of the conduct of public officials, and to keep the citizen posted on city affairs.

The school board does, indeed, exercise both the taxing power, including the sale of bonds, and the spending power. The public approval which it has earned is due not to the safeguards of law, but the safeguards of character. It is the high grade of men chosen for the school board which has protected us from wrongdoing.

Last year the revisers of the Boston charter considered and rejected the commission plan of government, and adopted the federal plan of city government, such as we now have in Indianapolis. The Boston finance commission made the most thorough study of municipal government which has been made in this country. It issued 127 reports. Its expert engineers made seventy-seven reports. That part of the report on the subject of commission government is so important that I quote it here at length, as applicable in almost every point to the situation in Indianapolis. It is as follows:

"The 'Elective Commission' Plan—The commission has given careful consideration to the plan recently adopted by a few relatively small cities, including some in this state, of vesting their entire government of the city in the hands of a small elective board or commission.

"An elective commision would be a return to the principle of the charter of 1822, in so far as that instrument withheld executive power and responsibility from the mayor.

"If the electorate will choose a bad mayor, a majority, or possibly all, of the officials elected under the commission plan would probably be men of the same character. The city would then be at the mercy of three or five bad men instead of one, and each could avoid responsibility by throwing it on the others.

"For small cities suffering under the rule of committee government, the 'elective commission' plan presents many advantages, and to such cities the plan has so far been confined. It is, however, too early to draw conclusions from these experiments. None of them is yet fairly in operation, except in Galveston, where the conditions of the suffrage are very different from those which obtain in the cities of the North. Even if ultimately successful in smaller cities, this is no assurance that the plan would work when applied to a city like Boston, with a population exceeding 600,000, spending $25,000,000 a year, and presenting political and municipal conditions and problems different not only in degree but in kind.

"The experience of the city under the school committee law of 1905 is not necessarily in point; for the opportunities for politics, patronage, corruption and waste in the management of the public schools are slight in comparison with those which are offered by the city government as a whole. Under the law of 1901 establishing the school house department, the school committee was purposely deprived of the power to buy land, and construct, repair and furnish school buildings; and this power was not restored to the school committee when reconstructed in 1905. The new plan has been in operation only three years, and its permanent value has not yet been demonstrated.

"The school committee system furnishes no more of an argument for an elective commission than the success of the state in recent years in the management of the police and license problems is an argument for putting the entire government in the hands of commissions appointed by the governor.

"A closer analogy is presented by the boards of county commissioners. The general opinion seems to be that these boards have not proved a success.

"All large and successful corporations are practically managed by one man under the supervision of the directors. If there is any defect in this system it is the frequent failure of the

directors to supervise, not their failure to manage the executive part of the company's business.

"There is at the present time a lively interest in municipal reform in all large cities of the country; but in none of them does there appear to be any desire for an elective commission. No one with experience in the city government of Boston has favored its adoption for this city."

The criticism of commission government made by such eminent authority as the Boston finance commission should have great weight, in my judgment. To sum up, commission government may be suited to small cities, but Indianapolis is much too large a place for it.

The Des Moines charter vests in the mayor and the four councilmen all the powers now exercised by our mayor, city council, board of public works, board of parks, board of safety, board of health and city controller. The law leaves the commission free to run the city finances as it pleases. It works smoothly, because there are only five men to harmonize. It is frictionless. It throws the rein on the horse's neck.

Against this view is urged that the referendum and recall are sufficient protection. The referendum means that if 25 per cent. of the lawful voters sign a written petition, the people may review the action of the council at an election. The same kind of a petition will secure an election to decide on ousting a member of the council. These provisions might work well in a small place, but what are we to think of a written petition in Indianapolis, with the names of one-fourth of the voters? It simply means that the acts of the council would go unchallenged in a city so large as this.

Proofs are not wanting. The Anti-Saloon League found that written remonstrances would work in small territories, like a ward, but were unworkable for an entire county, especially with the population of Marion county. Yet they were able to have a power of attorney for all remonstrances, and the question could only come up once a year. Council ordinances under the commission plan would be passed constantly, so that the referendum would break down at once, owing to the time, trouble and expense of petitions and elections.

Again in several places where the recall is in use, as at Haverhill, Mass., a commission town, and at Los Angeles, the defeated candidate has used it to get another chance to win the office, by having a new trial. It is a dangerous instrument, unless surrounded by conditions which make its use almost impossible in a city the size of Indianapolis. Again, in the case of a corporation franchise, such as a street railway, which goes to a popular vote as a matter of course without petition, we have high authority against it. Judge Lindsey, of Denver, Colo., a man of national reputation, on account of his connection with the juvenile court, has stated that in Denver it cost the city $10,000,000. The city government inserted provisions in the street railway franchise highly favorable to the company, because the city government felt the responsibility rested, not on it but on the people. The government could not be blamed if the people adopted the franchise, nor even if they rejected it. The franchise was adopted after a campaign which Judge Lindsey says was a disgrace to Denver. The people, in the mass, were unable to inform themselves concerning the complicated provisions of a corporation franchise, while corporation money and the use of able speakers did the rest.

At any rate, in a city the size of Indianapolis, the referendum and recall are not sufficient checks upon a council of five members with unlimited power. Private trust funds are not managed by the trustee alone. A guardian, administrator or receiver must have the approval of a second authority for expending or investing trust funds. He must apply to the court and secure its approval. Why should not public trust funds, amounting to more than a million dollars a year, be safeguarded with the same care? No good reason has been shown for vesting the power to raise money by taxation or by the sale of city bonds, the power to appropriate it for special public purposes and the power to spend it in the hands of the same set of men. The fact is, we need more checks rather than fewer ones. If the referendum and recall are good, let us add them as additional safeguards, but let no man be deceived by thinking that they will take the place of our present system, which separates the legislative from the executive power. Let us also have non-partisan elections and a stringent civil service law. Many of these things are good as amendments and additions to our present system. But the commission plan itself has nothing to do with these things. They are separate devices, used in various

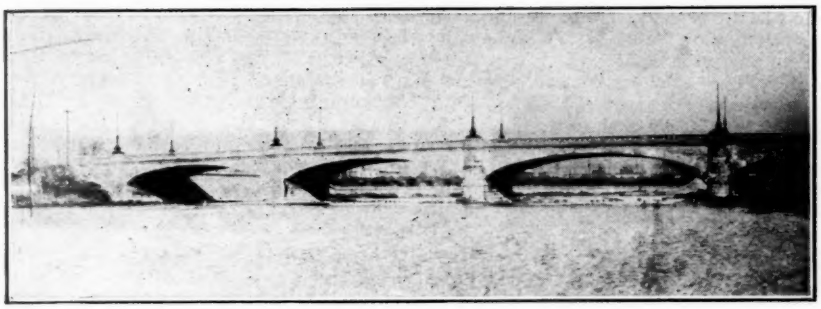
places where the commission plan is not in force. Is our memory so short that we have forgotten the experience of Indianapolis, when the council had exclusive power to raise money and spend it? Have we forgotten why the board of aldermen was created? It was because the people's money could not be trusted to the council alone. A second chamber was created as a check on the waste of public money. Shall we now ignore the lessons of our own past and trust to a single body of five men the disposition of our great revenues? We must assume bad men will get into office, and that the corporations will spare no effort to get their agents in such a small and powerful body. It is a short and easy road to the pockets of the people. It will be frictionless, silent, but it will be effective. It is nevertheless true that good government is at bottom a question of men. With good men the Des Moines plan is all right, but if we elect bad mayors, who do wrong in spite of publicity and discussion and criticism under our present system, what reason is there to believe that we will not be just as apt to elect bad commissioners? The difference is, that at present we have some checks on the tax eaters. Under the commission plan we shall have none. Let the friends of good government turn their attention away from the notion of breaking down the most effective restraint which has yet been devised for protection against bad men in office, in nation or state, in county or city. I mean, of course, the separation of legislative and executive power.

The White River Bridges in Indianapolis, Ind.

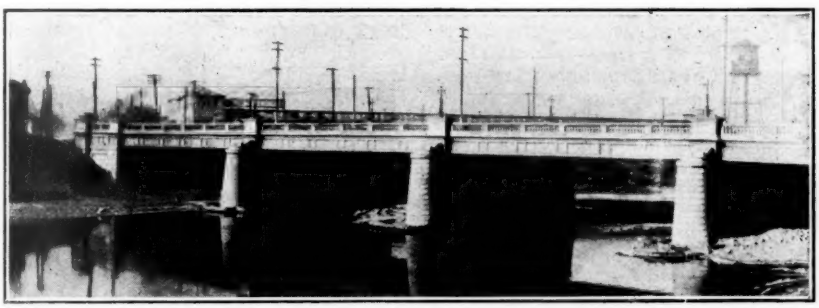
INDIANAPOLIS, the Hoosier capital, far famed as the locus of literary lights, has until recent years had little to boast of in the line of aesthetic civic improvements, particularly of the nature of river improvements. Fortunately for all concerned, two floods within a period of two months in the spring of 1904 effectually removed almost the entire list of inartistic and unstable bridges which spanned the streams within the city. This made possible the adoption of a plan for river and stream improvement, which was brought about in a rather peculiar manner.

The law allowed the city to call upon the county to construct the bridges, very properly, because the city of Indianapolis pays about ninety per cent. of the county taxes. The county commissioners therefore asked the county council at a special meeting to appropriate the sum of $750,000 for the purpose of replacing the bridges. It was necessary in order to appropriate money at any but the regular September meeting, that a two-thirds vote of the council be obtained. Through political reasons this necessary two-thirds vote was not forthcoming, so the movement was blocked. This brought the matter to the attention of the Indianapolis Commercial Club, a very efficient organization, where the welfare of the city is under consideration. The question of a thorough river and stream improvement along with the matter of the replacing of the bridges led to the suggestion of an improvement commission. A meeting was therefore called, in which the park, city and county officials were included; and it was developed that the County Council would be willing to appropriate the necessary funds, provided that the commission were given the supervision of preparation of plans and of letting contracts for construction. The directors of the Commercial Club thereupon proceeded to appoint a Bridge and Stream Improvement Commission, consisting of B. J. T. Jeup, city engineer; Harry W. Klausman, county engineer; J. Clyde Power, park engineer; and four citizens, namely, Medford B. Wilson, a banker; Ferd L. Mayer, a retail merchant; Edwin A. Hendrickson, a wholesale merchant, and Charles Carroll Brown, a consulting civil engineer, the last named being chairman. This commission secured from the County Council an appropriation of $830,000 with which to replace the missing bridges. With this, by the careful management of the county engineer in charge and the attention given to details of design, etc., by the commission, bridges were built at Morris street, River avenue, West Michigan street, Emrichsville, and almost enough funds were left to build a bridge at Thirtieth street, over White river.

White river holds an almost due



I. MORRIS STREET BRIDGE, INDIANAPOLIS, IND.



II. RIVER AVENUE BRIDGE, INDIANAPOLIS, IND.

III. WASHINGTON STREET BRIDGE, INDIANAPOLIS, IND.

north and south course through the western portion of the city, and consequently is crossed by a number of cross-town car lines, as well as a great many east and west thoroughfares. This necessitated a rather heavy type of construction as well as one that would meet the standards of beauty set by the commission. The Melan arch, or more properly the von Emperger arch, was adopted for all except one of the river bridges. This type of construction was chosen on account of its beauty and general adaptability to ornamentation and by reason of its strength and solidity. The arch ribs were of latticed steel, made to conform to the outline of the arch and set at a distance of three feet or less apart on each of the bridges. The stresses were computed for a maximum live load consisting of a 100-ton car. The following are descriptions of the bridges taken in order from the south.

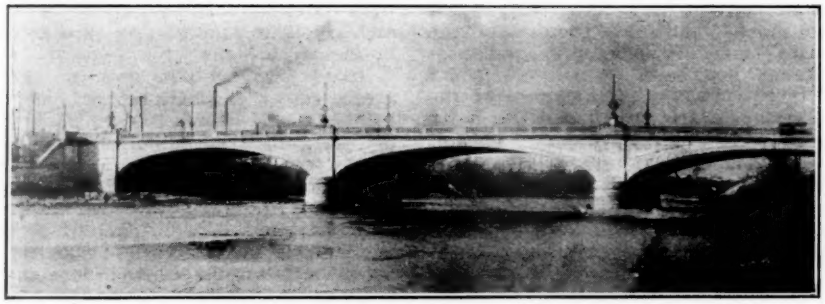
Morris Street. Photograph I shows the details of this bridge. It consists of two 90-foot spans, two 100-foot spans and the center span of 110 feet. The roadway is 38 feet wide and a 6-foot sidewalk is next the rail on either side. The photograph does not do justice to the appearance of the stone finish, which is of rock faced Bedford limestone, consistent in every detail even to the railing along the sides of the roadway.

River Avenue. The River avenue bridge, shown in the second photograph, is unique in several respects. Two of the spans shown are 85 feet in length, while the other three are of 86 feet. A 40-foot roadway and two car tracks are supported on two plate girders of standard construction. The 8-foot sidewalks on either side are supported by concrete girders, which are divided and set on rollers at each of the panel points to allow of free expansion and contraction. The ornamental work on the panels, and forming the posts and railings, is all of molded concrete and of particularly good workmanship. The excellence of detail and the fact that no attempt was made to disguise concrete as stone is certainly worthy of commendation. The structure, with its consistent adherence to straight line effect, has received much praise from competent critics.

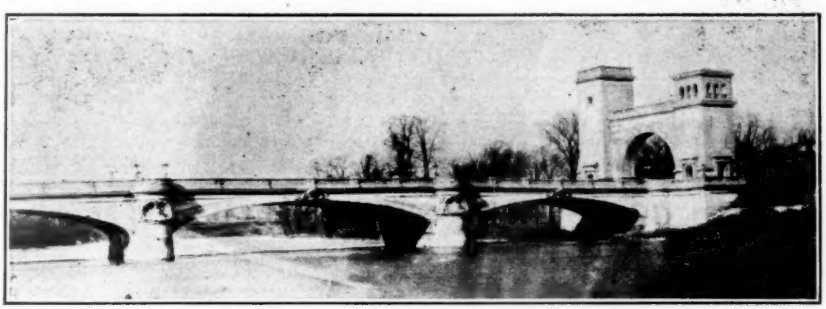
West Washington Street. This bridge, shown in the third photograph, was constructed before the regime of the commission, and was not damaged by the flood, and is perhaps the least satisfactory of the river bridges. The roadway and street car tracks are supported, as in the case of the River avenue bridge, on deck plate-girders, and the sidewalks on latticed girders; but the entire absence of any ornamentation other than a fancy railing along the sides of the bridge gives a sort of undressed effect which is not entirely pleasant. The number and length of spans are the same as in the case of the River avenue bridge.

West Michigan Street. The West Michigan street bridge is of the same general design as the Morris street bridge, as will be noted from photograph IV. It consists of two 110-foot spans and one 120-foot span, supporting a 40-foot roadway and two 10-foot walks. The facing is of buff Bedford limestone, finished in a panel effect as shown. Although the photographs do not admit of a very satisfactory comparison, the effect attained in the rock faced finish on the Morris street bridge is more pleasing than the smooth finish of the West Michigan street bridge. The discoloration on the first mentioned bridge, from efflorescence, causes an unsightliness which will not allow an appreciation of the beauty of the rock finish.

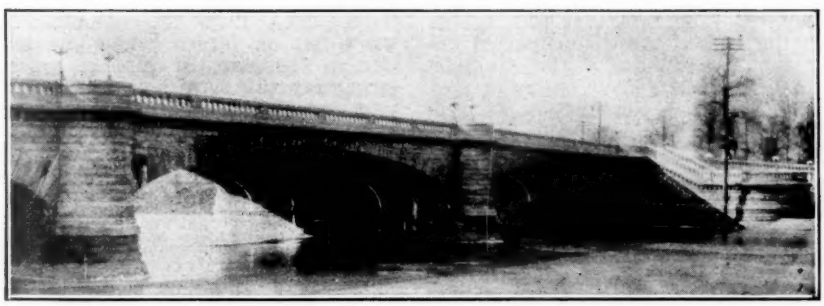
Emrichsville. This bridge, shown in the fifth photograph, is the most highly ornamental of the river bridges. It is placed on what is known as the Crawfordsville road, a pike very popular with automobilists. This road is also at the south end of Indianapolis' largest park, Riverside. An attempt was therefore made to make the bridge an ornamental gateway to this park. The park it at the right of the picture, as shown, so that the towers and gateway are on the inner end of the bridge. This was made necessary owing to the fact that the approach on the opposite was blocked by a steep bluff and a turn in the road. The bridge consists of two 94-foot spans and one 104-foot span. The roadway is 25 feet in width with an 8-foot walk on either side. The facing is of buff Bedford limestone dressed and ornamented with panels and carvings. The towers and arch at the end, with the railed steps leading down into the park, make a very artistic appearance, as seen from the boulevard along the river bank and from the Crawfordsville road. From that side the sea shell and dolphin carvings on the piers make a much more pleasing appearance than from the angle at which this photograph was taken.



IV. WEST MICHIGAN STREET BRIDGE, INDIANAPOLIS, IND.



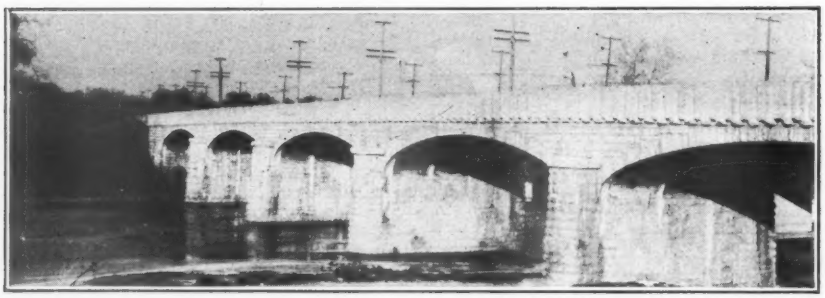
V. EMRICHSVILLE BRIDGE, INDIANAPOLIS, IND.



VI. THIRTIETH STREET BRIDGE, INDIANAPOLIS, IND.

Riverside. The Riverside bridge, or more properly the Thirtieth street bridge, shown in photograph VI, is the most beautiful structure of the entire list. It has a massiveness without heaviness which the width of the roadway, the thickness of the arch ring at the crown and the treatment of the approaches makes distinctive. This effect is consistently aided by the use of rock faced stone in the facing and ornamentations, which are in entire accord with the design of the structure. The two end spans are 94 feet in length, while the center span is 104 feet. A 50-foot roadway and two 10-foot walks give ample space in which to carry out the effect of a continuation of the boulevard straight across the bridge. On both sides of the river, on the upstream side, platforms and steps are built in such a manner that the lowest platform may be used as a boat landing. These platforms are walled and given the same general treatment as the main portions of the bridge, so that they appear as a part of the whole structure. The fact that this bridge was the last of those constructed under the supervision of the Commission, being partly paid out of money saved from the construction of previous bridges, would seem to be indicative of the development through experience, and a promise for the future. It is an example of good taste and excellent construction rare among municipal bridges.

Broad Ripple. The seventh photograph shows a small bridge recently completed in Broad Ripple, a suburb of Indianapolis. It consists of five 66-foot spans carrying only a 26-foot roadway. The facing is of rock faced stratified limestone, laid in severely plain designs. The bridge, while not particularly pleasing in appearance, is an example of stable and permanent construction seldom found in semi-municipal structures. It is outside the city and was built after the Bridge and Stream Improvement Commission had completed the work for which it was appointed, so that it did not have the criticism of that organization.



VII. BROAD RIPPLE BRIDGE, INDIANAPOLIS, IND.

The foregoing description will serve as an indication of the tendency towards beauty of design and detail, as well as utility in municipal bridge building. The movement towards civic improvement in all lines should make itself felt on future bridge construction in Indianapolis, and the present structures will furnish a good foundation upon which to build a system of municipal bridges second to none.

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Buffalo's Plans to Transform Bird Island

By H. G. Anderson, Buffalo, N. Y.

BUFFALO, like all other progressive cities, realizes that it cannot provide too many breathing spots for its citizens. Our parks attest our city's timeliness in that respect. Yet, our public recreation places, almost without exception, are not up to their possibilities, in that they are inland. Buffalo's location, on lake and river, is a great factor in the city's attractiveness. Yet, municipally, we have not taken advantage of our water front and its possibilities for pleasure purposes.

The most popular point of departure in the city for the pleasure seekers is the foot of Ferry street. The Niagara river is the city's play ground. The variety of aquatic enjoyments and scenic splendor that it offers is well-nigh unrivaled. Bird Island Pier is the key to the waterway's attraction; it is the automobile gateway to Canada. Yet, there is hardly a section of the city so dilapidated, so unsanitary and so repulsive as the foot of Ferry street in its present condition.

To remedy this, and to take advantage of an unusual opportunity, the West Side Business Men's Association has instituted a project that is well worth the consideration of our taxpayers throughout the city. If the plan is fulfilled, Ferry street will be transformed from an unsightly lane into a broad, well graded thoroughfare, and Bird Island Pier, from an unkempt cluster of squatters' premises, into a spacious park. By furnishing dockage for excursion craft, the property would furnish sufficient revenue to offset the original cost within a few decades.

The property to be acquired runs from the foot of Albany street on the south to the head of Squaw Island, near the foot of West Delevan, on the north. According to the reports of the United States engineers, this contains 2,991 lineal feet, of which ten tenants, with revocable leases, occupy 1,041 feet, twenty-one squatters occupy 659 feet, and 1,291 feet are vacant. This land can be acquired by the city at little expense by cession from the state and federal governments.

The necessary preliminary to the improvements on the pier proper is the widening and grading of Ferry street from Niagara street to the new Black Rock Harbor. The plan calls for a width of sixty-six feet, with wide concrete sidewalks on both sides. This part of the improvement is practically assured. Already a notice of intention has been prepared for that purpose by Alderman Staples and the city engineering department. A bascule bridge, spanning the new harbor and fully as wide as the improved Ferry street, will be erected by the federal government.

The bird's-eye illustration of the plan in detail shows the magnitude of the improvement that would be effected. On the new Black Rock Harbor there would be a frontage of 2,500 feet, available for boats of all draughts, bound either up through the harbor, out to the lake, or down through the new federal lock at Black Rock out into the river. On the river side there would be another 2,500 foot frontage, with dockage facilities. The north end, at the head of Squaw Island, would be 410 feet in length, and the south end, at Albany street, about 100 feet.

Excursion dockage is provided for in the proposed plan. But little motor craft that swarm the river have not been neglected, as the project calls for a small lock between the pier and Squaw Island for the transit of small boats to and from the river. This would obviate the inconvenience of using the mammoth lock at Amherst street. The small lock could be operated by one tender, and at a slight expense.

To the huge triangular park, a great deal of filling-in would be necessary —work which would ordinarily involve great expense. Circumstances, however, make it possible to get this done at practically no cost, in that the dredgings from the strip that now separates the canal from the harbor from Ferry street north can be dumped to advantage both to the government and the city on the Bird Island property. The federal government will probably let the contract for this work some time next spring. Negotiations should be entered into at once looking toward the utilization of this property as a dumping ground for the dredgings.

The estimated initial expense involved in the improvements as proposed, would be only $350,000. The revenue that would accrue from excursion boats, ferries, etc., would more than pay all interest, and would provide a sinking fund sufficient to pay the bonds in full at maturity. It would be an improvement to be enjoyed by generations to come. To put it through now would be economy Later, the expense would be many times greater.

It is far from a sectional project. The whole city reaps the joys of Niagara river, and Bird Island Pier is the gateway. No better proof of the city-wide character of the plan could be adduced than the sentiment of the taxpayers. Over fourteen business men's organizations throughout the city have already heartily endorsed it, and have appointed committees of three to co-operate with the West Side organization to push the plan through when the time is ripe for action.

The project has passed the speculative stage. The details have been worked out and approved by Col. Ward and Captain Norton of the City Engineering department, Engineer Jones of the Federal corps and Col. Alexander. The co-operation of the Federal Government seems assured. The plan awaits the verdict of Buffalo. In view of the desirability of the improvement, and its economy as a business proposition, the verdict cannot but be favorable.

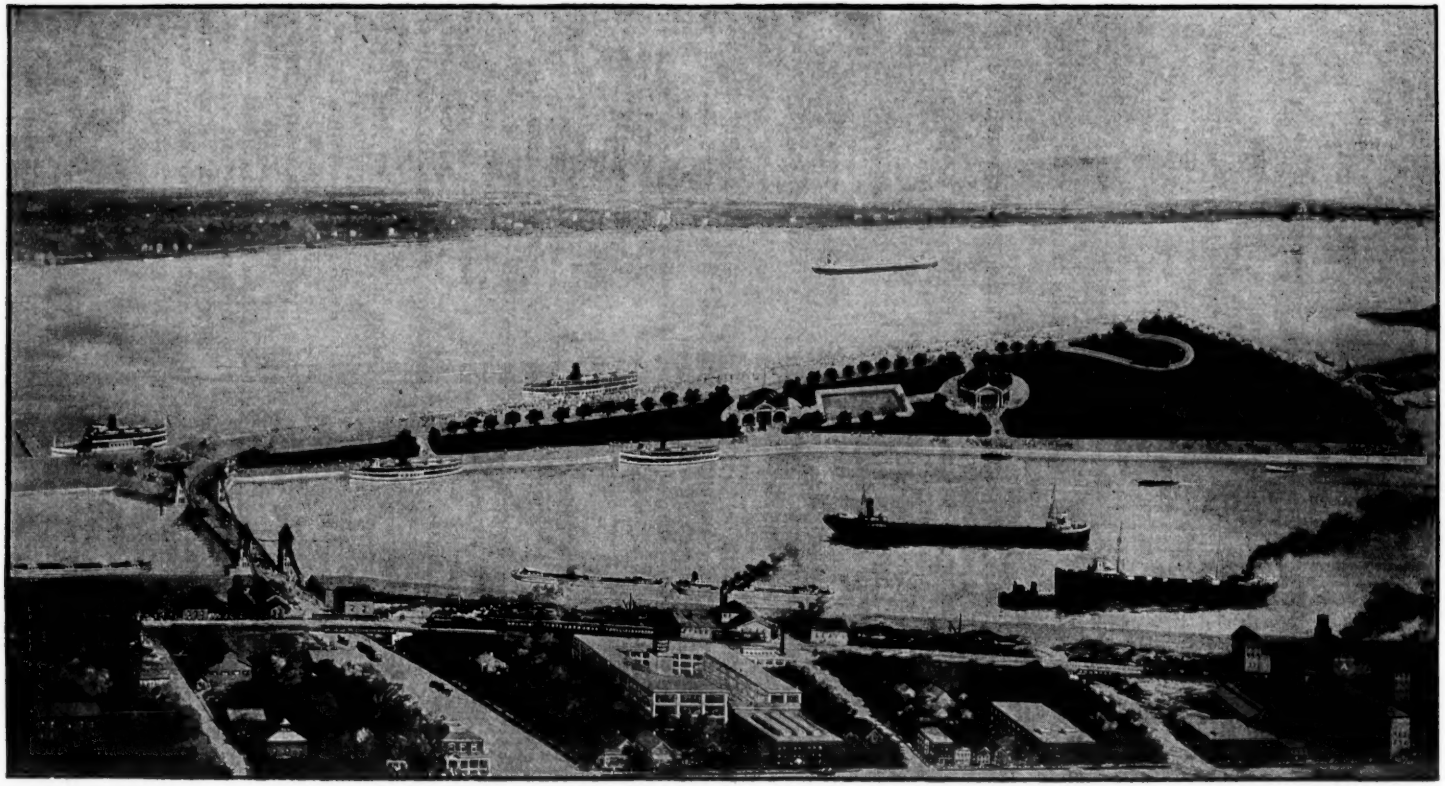
It is not often that such a great opportunity is offered to a great city. It would mean the acquisition of eighteen acres and the establishment of a park, comprising excursion dockage, swimming pool and garage, conveniently located on the banks of a majestic river. To take advantage of this opportunity will add one more to the factors that make Buffalo the Ideal City.

Apparatus for Efficient Fire Fighting

BY the time the fire engines arrived the building was a mass of flames, and adjacent houses were catching fire from the intense heat. This sentence or one very similar may be found in the description of almost any of the large fires of which we read. In "The Burning of Chelsea," a book giving a vivid description of the destruction of that Boston suburb, in April, 1908, it is stated that when the heavy apparatus arrived at the point where the fire started, "the flames were licking up the inflammable building and sending a shower of sparks, blown by a forty-mile gale, towards the heart of the city." In connection with this statement a picture is given of the horse-drawn fire engine responding to the first alarm. The picture was taken at a point where the horses were apparently not going faster than eight miles per hour over a street paved with rough cobble stones. This is just one of the many examples which prove true the assertion that " a minute at the start of a large fire means the saving of hours in subduing it."

It is this initial time-saving element more than any other which is bringing about the general adoption of the motor fire apparatus. The plunging horses drawing the heavy apparatus through crowded streets clanging and clattering over the pavement, have been thrillingly described by writers of fiction and in the daily papers. But no one saw fit to comment on the fact that for all the noise and appearance of speed, the horses with their plunging, rocking chair motion were not going faster than from 8 to 12 miles an hour, and even at that speed they possessed an inertia such that it was difficult to check their progress to avoid an accident or upon coming to the fire. Contrast a run of this horse-drawn apparatus with the more modern motor-propelled type. In the latter case the apparatus is driven safely through the streets at a speed of 25 or more miles per hour, always under perfect control and capable of being brought to a sudden stop in case of need. Within a radius of one mile, motor-driven apparatus will save at least one-third of the time; while outside this limit it saves from one-half the time upwards, depending on the distance. Due to this fact an auto-engine can cover the territory of two or three horse-drawn engines and do it more quickly.

The expense of up-keep is naturally one of the first questions asked



PLAN FOR IMPROVEMENT OF BIRD ISLAND, BUFFALO, N. Y.

relative to the automobile fire machines, and the arguments advanced by the opponents of the more advanced apparatus are usually very similar to the following, clipped from an Eastern paper.

"It is argued that the auto-machines would be cheaper than the present apparatus, because with the former in service there would be no horses to keep and employ a veterinary for. But what of that? The autos would always be in need of repair. An auto-machine is not a horse and it will not eat, but it will swallow money, just the same. An auto needs repairs occasionally, just the same as a bicycle or a horse."

It is difficult to conceive of the class of repairs necessary on a horse, but otherwise the writer states a very general misunderstanding. This sort of argument is entirely disapproved by the statement of fire chiefs who have had the supervision of motor apparatus in active service. In a paper by J. H. Carlisle, chief of fire department, Vancouver, B. C., the following comparison is offered between the relative cost of maintenance for one year between a horse-drawn hose wagon and an auto hose wagon, the latter having been in service for two years.

Hose capacity, horse-drawn, ft.	1,000
Hose capacity, auto, ft.	2,000
Alarms responded to, horse-drawn	41
Alarms responded to, auto	146
Miles traveled, horse-drawn	98
Miles traveled, auto	288
Cost of maintenance, one horse-drawn hose wagon	$866.00
Cost of maintenance, one auto hose wagon	$201.50

As will be noted, the auto apparatus carried double the amount of hose, responded to 105 more alarms and traveled 190 miles farther than the horse-drawn equipment. Chief Carlisle offers a further comparison between two stations, each built to accommodate three pieces of apparatus, one being equipped with auto and the other with horse-propelled apparatus. This comparison shows a great saving in the favor of the motor equipment.

In a paper given before the International Association of Fire Engineers, Charles F. Allen, chief of the fire department of Trenton, N. J., offered a comparison of cost of the two types of apparatus. Both were engine companies, the auto company numbering seven men in its crew and the steam engine apparatus requiring nine men. Both were in the same district and did the same work, and the following table gives the results of the comparison.

Cost of maintenance of engine company one year	$885.41
Cost of maintenance of auto company one year	151.60
Total saving of	$733.81
Salaries paid to engine company, nine men	$8,129.80
Salaries paid to auto company, 7 men	5,770.00
Total saving in salary	$2,359.80
Total cost of engine company	$9,015.21
Total cost of auto company	5,921.60
Saving in comparative cost of maintenance	$3,093.61

At the same convention W. H. Loller, chief of the fire department of Youngstown, Ohio, gave an account of the maintenance expense on an auto fire engine, which had traveled over 1,200 miles at a cost of $98.00. Other reports were offered at the same place, telling of the economy of operation of motor equipment, and in no case was it shown the horse-drawn apparatus could be maintained within twice the cost of that auto-propelled.

The adaptation of the gasoline engine to the purposes of practical fire fighting is receiving a great deal of attention at present, and a number of firms manufacturing motor fire apparatus are supplying motor-driven fire engines, the pumps of which are gasoline operated. Mr. George W. Booth, chief engineer, committee on fire prevention, of the National Board of Fire Underwriters, supervised a series of tests, the results of which are given in the proceedings of the International Association of Fire Engineers. No comment whatsoever is made on the results of these tests other than to recommend the following provisions for the automobile fire engine:

"That the engine and pump shall be able to deliver the rated capacity of the pump at 120 pounds net pressure, and at least 50 per cent. of its rated capacity at 200 pounds net pressure. A 20 or a 30-minute run under each of the above conditions will usually suffice to determine the ability of the engine, but it would be well

to specify an endurance run of 2 or 3 hours if such a test appeared desirable."

The results of these and other tests seem to indicate that only a very little development is needed along the lines of pressure and capacity to make the motor pumping engine the superior of the steam engine. At present any points in favor of the latter type are more than equaled by the rapidity with which the motor equipment can get into action; by the fact that full rated pressure is attained at the moment of starting, and for the reason that an amount of fuel capable of operating it continuously for several hours, is self-contained within the apparatus.

The auto engine is furthermore capable of being propelled through roads and over grades which are entirely inaccessible to the horse-drawn steamers. In Trenton, N. J., an automobile engine of only 30 horse power was driven through snow, which was two feet deep on the level and drifted in places to four to six feet in depth. After arriving at the fire at the outer edge of the city, the engine pumped steadily for almost five hours.

In Birmingham, Ala., an automobile engine is in constant service in a district where in places the street grades are 13 per cent. Other instances are recorded in Seattle, Washington, Lansing, Mich., and a number of other cities, which show conclusively that the auto engine will overcome road difficulties which would block the heavy horse-drawn steamers. As for the cost of maintenance of the two types, the following comparison is taken from two pieces of apparatus under similar service.

Annual cost of maintaining five horses in fire department station.

Horse feed, at $150	$750	
Shoeing	180	
Veterinary and medicine	100	
Harness repairs and replacements	75	
Stable equipment — blankets, brushes, stall repairs, manure hauling, etc.	175	
Total maintenance, five horses		$1,280
Cost of operating fire engine.		
Coke heater for maintaining steam under boiler	$190	
One-fifth cost of maintaining fuel wagon	260	
Fuel	90	
Rags, polish, oil, grease	20	
Wages of engineer, stoker, 1 engine driver, 1 hose wagon driver	3,780	
Total		$4,340
Total cost of operating one steam fire engine		$5,620

Annual cost of maintaining motor fire engine.		
Tire replacement	$200	
Gasoline and oil	50	
Kerosene for lamps	4	
Battery charging	3	
Rags and polish	15	
One operator	1,200	
Total		$1,472
Saving in favor of motor equipment		$4,148

Disregarding the cost of maintenance and granting that the present steam fire engine can, after it gets into service, throw a greater volume of water than the present motor engine, the latter must be held superior in the following particulars. Suppose a specific instance in which an alarm is turned in at a distance of one mile from the engine house, the run being made over paved streets. The motor engine will easily cover the distance and have a stream of from 400 to 700 gallons per minute on the fire inside of 2½ minutes. Of the seven men forming the engine crew, only one is required to look after the apparatus, the other six being free for active fire fighting. The apparatus may be placed as closely as desired to the fire without fear of falling sparks, etc. At the end of five minutes the horse-drawn steamer will be on the ground and inside of perhaps ten minutes will have worked up to maximum discharge. Of the engine crew of nine men, at least two are needed to look after the engine and hose wagon horses. Two more are necessary to look after the engine in the capacities of engineer and stoker. This leaves but five men for active service. In event of a long, continuous pumping, the problem of obtaining fuel for the steamer is one that must be considered, while the auto carries with it sufficient fuel for an hour's run and more may be procured without the aid of a team and wagon. Finally there is the possibility of a number of alarms in succession from the same district, in which event the horses are soon exhausted; but the

motor apparatus remains as speedy as before.

More than 100 cities of the United States have adopted and have motor equipment in active service at this time, and among these cities old style horse-drawn apparatus is being replaced by new types until some of them have only the latter in service. The duplication of motor equipment after a thorough trial is the best recommendation that can be given for the more efficient fire-fighting machines.

George Washington's Surveying Outfit*

By T. Hugh Boorman, New York City

I AM indebted to the Hon. Andrew S. Draper, Commissioner of Education of the State of New York, for the accompanying photograph of all the surveying instruments of George Washington in the possession of that department of the Empire State. This is accompanied by a copy of a pen-written statement pasted inside of cover of instrument box.

"The instruments contained in this box, together with a case of protracting instruments in a shagreen case, two surveyors' chains and the wooden pins used with the same, were the property of General Washington, and used by him when a very young man.

"These instruments descended to my father Colonel William A. Washington (the General's oldest nephew), and from him to me, and by me presented to my son, Lewis W. Washington, February 10th, 1854.

Signed, "G. C. WASHINGTON."
Georgetown, D. C., Feb'y 10, 1854.

The instruments photographed consist of

1. Pocket Protracting Instruments.—A case of mathematical instruments covered with silver hinge and hasp, the same in form as is still sold for students.

2. Box of Surveying Instruments.—This oaken box, 14½ inches long by 7½ inches wide and 4 inches deep, contained, besides a compass, various instruments, all of brass, such as a scale of parts, parallel ruler, spirit-level, etc. Washington commenced his studies in surveying when he was 14 years of age, as appears from a manuscript volume of his "Book of Surveys, 1746," now at Cornell University. Lord Fairfax appointed him surveyor for his own lands, with a compensation of $3.50 a day, when he had just entered his sixteenth year, and he became public surveyor of the province, after two years' service with Lord Fairfax, for the three following years.

3. This compass, which was contained in the box above mentioned, has engraved on its face, "D. Rittenhouse, Philadelphia." Its maker, David Rittenhouse, was the distinguished astronomer, who became president of the American Philosophical Society and was a commissioner to define the boundary between Pennsylvania, New Jersey and New York in 1769-70. He was born in the same year as Washington, and was engaged in the manufacture of mathematical instruments and clocks at as early a period as the former commenced surveying. It is impossible to say whether this compass was manufactured by him before he opened an establishment in Philadelphia in 1770, as there is no date upon it. His first shop was opened in Norriton, near that city, in 1751.

4. Surveyor's Tripod.—This is made of oak, mounted with brass. The three legs are each in two sections, with brass screws to unite them, for the purpose of easy transportation on horseback. In the original inventory it was described as "Jacob's staff."

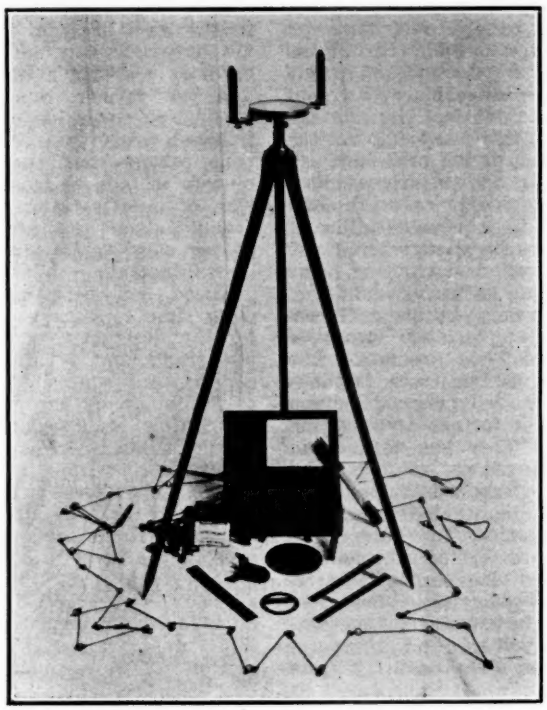
Measuring iron chains, the large sized one, 33 feet 2 inches long; the small size, 30 feet long. This is the first used by him, and probably some of the links have rusted off. Also, six wooden marking pins, of ash.

Dr. H. Leffman claimed that "Washington was not a college man." This does not agree with the positive statement of Henry M. Wilson, C. E., in his address before the American Society of Civil Engineers at their semi-centenary in 1902, when he called attention to the fact that Washington is reported to have evinced marked

*From a paper before the Congress of Good Roads at Indianapolis, December 6-9, 1910.

aptitude for mathematics at the early age of 11. He took a course of surveying and navigation at Dr. Williams' school in Westmoreland County, Virginia, and became so interested in these branches that later he served a special apprenticeship in practical work under William James Genn, a learned surveyor.

came, to quote him, "The channels of conveyance of the versatile and valuable trade of a rising empire," but he was also the first to commend and predict the commercial success of that route through the Mohawk valley which was afterward taken by the Erie canal and the New York Central railroad.



GEORGE WASHINGTON'S SURVEYING OUTFIT.

In the clerk's office of Culpepper Court House is recorded the following:

"The 20th July, 1749 (O. S.), George Washington, Gent., produced a commission from the president and master of William and Mary's College, appointing him to be surveyor of this county, which was read and thereupon he took the usual oaths."

Washington was not only the first to map out and recommend the general route of the great highways called the National pike and the Chesapeake and Ohio canal, which latter, in truth, be-

The National pike, the route of which was practically located by him and the construction of which he planned from the Great Falls of the Potomac to Pittsburg, was, and still is considered to be one of the best aligned, best graded and best macadamized roads in America.

It is a matter of record that while Major L'Enfant is to be credited with working out the details embodied in the plans of Washington City, it was President Washington who, as a consulting engineer, directed the work of L'Enfant.

To What Extent Do Automobiles Destroy Our Roads? *

By Logan Waller Page, Director, U. S. Office of Public Roads, Washington, D. C.

THIS question and its immediate sequel, "What shall we do to prevent this destruction?" are the summing up of the most serious problem with which road builders have now to wrestle, and with all the discussions as to "cause" and "remedy" which have taken place in recent years, we cannot yet feel that we are any more than fairly started on the way to a solution of the problems.

In considering the injurious effect of motor traffic on our roads, I shall confine myself to a consideration of what has always been considered our highest type of construction, the broken-stone road, as first specified by the eminent French engineer, Tresaguet, in 1775, and later improved upon by Telford and Macadam. The principles involved in their methods of road building really depended upon the wear of traffic for the preservation of their roads. They had to contend only with horse-drawn vehicles, and the dust which was constantly being worn from the stone acted as a filler in the road surface, and under the action of moisture formed a cementing medium between the stones. Therefore, in a well-constructed macadam road, where the selection of stone was suited to the volume and character of traffic, the fine dust resulting from wear was just sufficient to replace that carried away by wind and water; the action of water caused this remaining dust to re-cement and the surface was thus automatically rebonded. Moreover, the road surface remained practically impervious to water and the foundation was protected.

The advent of the automobile has, however, completely changed conditions, and the seriousness of the problem becomes more impressive when we consider the rapid advance in the production of motor-propelled vehicles. It was estimated that on November 1, 1908, there were in the United States about 150,000 automobiles. The output in 1908 was 55,000 cars, for 1909, about 80,000, and it is anticipated that the close of the current year will hace seen a year's production approaching the 200,000 mark. And, whereas the early output went largely to the large centers of wealth and were looked upon as a rich man's latest luxury, we now find the automobile in common use throughout the length and breadth of our country, not a luxury, but a necessary means of daily travel for the business man and the farmer, who is the better enabled to cover his often widely distributed property. It has, therefore, come about that the smallest community is face to face with the problem of meeting the new conditions brought about by these changes in the character of traffic passing over their local highways.

There has been much discussion from time to time as to the reasons for the destructive action of automobile traffic, but I think the series of experiments conducted by the Office of Public Roads has given some most interesting and conclusive results, which, although previously published, will bear repetition in the present instance. A 60-horse-power car stripped for racing and weighing with driver and mechanism about 2,800 pounds, was driven over a stretch of level, broken-stone road, first at five miles an hour, with increasing rates of five miles an hour until a speed of sixty miles was attained. The road was a section of government road which had been resurfaced two years previous to the test and was in good condition. Photographers were stationed at a point on the road designated for the proper speed and photographs were taken of the effect produced during the passage of the car. It was evident from a consideration of these photographs that up to fifteen miles an hour little or no effect was produced on the road, and even at twenty miles an hour the observers concluded that no serious damage was done. From twenty miles an hour on, however, the effect was decidedly noticeable with each increase of speed, and the dust is often lifted from the road by the severe shearing stress of the driving wheels, which I have compared to the action of a circular saw going through a board. Once lifted from the road, this fine material is subjected to the

*Read before the Southern Appalachian Good Roads Association.

effect of air currents generated by the car body and subsequently by the wind. Thus, large quantities of the very material that is essential for bonding the road together are rapidly carried away, the wearing stones are soon left bare and loose, and subject to displacement, water finds its way into the body of the road and a general deterioration rapidly sets in. It is therefore evident that the most serious damage to our roads as a result of increased motor traffic is due to the shearing stress of the rear wheels on the road surface when the machine exceeds a speed of twenty miles an hour.

There is another source of injury, which is not so serious, for the reason that it is confined to rather sharp curves and easily overcome. This is the tangential stress or tendency of the car to skid in rapidly rounding a curve, thus shifting the crown of the road tangentially to the gutter. This difficulty may be obviated by raising the outer side of the road.

But while the automobile is continually lifting the valuable binding material from our roads, and causing injury to crops, property values, and even the health of the neighboring communities, it is doing absolutely nothing toward replacing the dust so distributed. The principles of Macadam and his predecessors are set at naught, for whereas the iron-tired, horse-drawn vehicles of other days caused a continual replenishing of dust, the motor-driven car, with its pneumatic tire, is practically without any wearing effect on the road stone. As motor traffic increases, a point is reached where the type of road has to be changed, and this point varies with the volume of horse traffic and the volume and speed of motor traffic, a condition in part brought about by a failure of the motor vehicle to produce sufficient wear on the road surface.

It is those who have the building and maintenance of our rural highways who are most seriously affected by this great problem. It is comparatively easy to control the speed of motor traffic through our larger towns and over the park systems of our cities, and it is admitted that at low rates of speed the motor vehicle is no more injurious to the road than ordinary traffic. But, in the open country, where we have the grinding action of the iron tire and heavy load followed by the high-speed automobile throwing up and distributing the products of wear, we are confronted with the necessity of providing a new and more durable form of road.

For several years past, highway engineers and chemists have been uniting their efforts in attempts to solve this problem, and, generally speaking, have experimented along two lines, either to add some palliative to the surface of the road, in order to hold the dust, or else to construct the road with the use of some binding material that will hold the stone in place. Water was the original dust layer, but its continual application is costly, especially on long stretches of open highway where facilities are not always at hand for securing water. The addition of hygroscopic salts to the sprinkling water was then tried with the object of having the salt retain the water in the road surface, and in this respect calcium chloride has proven fairly successful, although even this very hygroscopic salt has a tendency to dry out unless the climate is quite humid. The lighter residual oils and tars have been used in holding down the dust with varying success dependent on the quality of the material, its method of application and adaptability to the character of the road in question. And right here it may be said, that while I do not think a fully satisfactory solution of our great problem has been reached, it is an unquestionable fact that a large percentage of the failures to date has been due to the application of inferior materials, deficient in certain well-known necessary characteristics or to the use of good products in conditions to which they are not adapted. There has been a too general acceptance of the fact that any oil or tar is a good dust preventive or road-building material, and that whatever the eager salesman guarantees (?) must be good and fulfill all the claims he makes for it.

While results from surface treatment can only be regarded as temporary, lasting, perhaps, in the case of proper oils or tars, throughout a season, more permanent results have been secured through the application of some of the heavier bitumens during construction. These may be applied either by heating and mixing with the upper coarse of stone before spreading, known as the mixing method, or by pouring the hot bitumen into the upper course of stone after it has been shaped, known as the penetration or grouting method. The former is the better way, in that a more uniform distribution of the binder is secured, but the method in-

volves considerable expense, as well as time, especially where a proper plant is not available and the mixing has to be done by hand.

By working along those lines we have certainly bettered conditions and produced a highway better fitted to resist the ravages of modern traffic, but there is much work ahead of us before we can say that we have wholly solved our problem. Automobile production is increasing with rapid strides, the distribution of cars is becoming daily more general, and whereas almost the entire output of cars has until now been largely for passenger transportation, I believe the next ten years will witness a great development in freight transportation. In England large quantities of food are transported to the city of London in trains of cars drawn by traction engines, and these trains return to the farms with supplies. The value and economy of motor transportation for freight in cities has been demonstrated and the economy of building roads over which it can travel in the country will become more and more evident to taxpayers in rural districts. And while there is a tendency on the part of many severely to arraign the automobile for its destructive action on our public highways, they should not lose sight of the other phase of the subject which is worthy of serious thought. The application of mechanical arts to our daily convenience and comfort must necessarily introduce new problems which require long and patient experimenting for their solution, but, when solved, are apt to produce a betterment of conditions that might otherwise not have been reached. So the motor vehicle, while tending to destroy our broken-stone roads, has had an improving influence, not only in the building of many miles of better highways, but in rendering most urgent the study of road improvement and preservation. The dust nuisance antedated the automobile by many years; if our experimental work leads to success, it will demonstrate the really beneficial effect to ourselves and posterity that motor traffic has had upon the development of the art of road building.

State Regulation of a Massachusetts Telephone Company

IN these days of increasing agitation in favor of the control or supervision of public service corporations and of large companies many new problems are developing in regard to the methods of managing and valuing such concerns. It seems that the ultimate end most desirable in all lines of industry is combination to effect economy of operation and public control to prevent the pooling of prices or unfair rate making.

An example of public regulation that is a model in its accuracy, soundness and fairness is that recently accomplished in Massachusetts by the State Highway Commission and the telephone companies. A record of this investigation contains valuable information for the investor, for the telephone user and for the telephone operating company.

The specific charge against the New England Telephone and Telegraph Company, which was brought in September, 1906, was over-capitalization and excessive and inequitable rates. The commission's handling of the charge of over-capitalization involves the straightening out of a tangled situation that is typical in these days of properties formed by a progressive consolidation of small companies. The New England Telephone Company is the result of a combination of a good many smaller companies, each of which had certain records of construction outlay, operating expense, etc. It was found, however, that the accounts of the final company were entirely inadequate as a basis for valuation. The commission, therefore, had their engineers make a detailed inventory of all the company's physical property in the six New England states. Every pole, every foot of wire, every instrument, the exchanges and their equipment, lands, buildings and property of every sort was properly inventoried and valued.

From this inventory it was found that the telephone company had actual property amounting to $100 for every $84 worth of securities issued. To this valuation was added what was considered a just value of intangible

or overhead charges, including cost of engineering, salaries, interest, etc., during construction operations. In telephone construction the total charge that should be made against capital account over and above the actual expenditures for physical property has been determined as about 20 per cent., being apportioned as follows: 10 per cent. for preliminary engineering expenses and engineering supervision during construction, 4 to 6 per cent. for taxes, 1 to 2 per cent. for insurance, and from 5 to 10 per cent. for the cost of selling the securities.

The readjustment of the telephone rates might seem at first sight to concern only the telephone using public, but it was clearly demonstrated by investigation of the Massachusetts commission that this readjustment of rates was of vital interest to the holder or intending investor in public service securities.

The principles upon which the commission proceeded in fixing the telephone rates were those first applied by Prof. Jackson in his study of the Chicago telephone problem in that city. The whole idea of this system is to make each branch of telephone service stand on its own legs. It developed in the course of the investigation that the actual cost in Boston and vicinity, of handling each call was in the neighborhood of 2½ cents. It was further shown that not infrequently large users of telephones secured their service at rates as low even as ½ cent a call, the loss to the company being, of course, made up by the small users. Up to the time of this investigation the system of accounting of the telephone company was such that it could only tell in a lump sum the amount of its income and the amount of its expenses.

One of the most important recommendations from the point of view of the investor, which was made by the commission and adopted by the telephone company, was the installation of a system of accounting devised by Prof. Jackson and a firm of expert accountants in the Chicago investigation, by which the necessary facts could be obtained to show the exact expense and income of each class of service.

The danger of not knowing where the leaks are occurring is of vital interest to parties holding securities of any corporation. On the extension of the non-paying systems of service the company would immediately commence losing money without being aware of how it was going. This point was very clearly illustrated by the fact that the New England company installed a new system of accounting as recommended by Prof. Jackson and made a year's trial run, ending in March, 1910. The new accounts show that the company was furnishing certain classes of telephone service at a heavy loss, and that the classes of service upon which it was making a profit did not return sufficient to overbalance the losses. Although the company has been paying 8 per cent. dividends upon its stock, together with the interest upon its bonds, it was found that in order to do this the company had neglected to set aside proper reserves for depreciation, and obsolescence of its plant. In other words, as the company had been conducting its business it was approaching the time when it must face the expenditure of millions of dollars for renewal of plant without having any reserves provided to meet these expenditures. It is evident that it was headed straight for trouble.

The investigation of the highway commission has established the company's accounting system upon a sound, adequate basis, has made the owners of its securities feel more secure, has removed the probability of mischievious legislative interference and has established a system of rates which will undoubtedly greatly increase the business of the telephone company, much to the advantage of the user of every telephone, owing to the extension of this service. Probably no more sound judicial and scientific investigation of the sort has ever been carried through in this country, and from every point of view it would seem to be a model deserving of close study and of imitation by other communities.

One of the most striking features of this entire investigation has been the spirit of co-operation exhibited between the telephone company on one hand and the commission and their engineers on the other. The entire expense of the commission during the investigation was borne by the telephone company by means of a special tax; but this was only a portion of the total expenses borne by the telephone company during this investigation.

EDITORIAL COMMENT

A National Good Roads Association—The Des Moines, Indianapolis and Boston Plans of City Government

A NATIONAL GOOD ROADS ASSOCIATION.

Those who pay a little, and but little, attention to the good roads movement may very easily become confused in the number of national associations devoting their attention to this subject. There are the National Good Roads Association, the National Good Roads Congress of the American Automobile Association, the American Road Builders' Association, and, latest of organizations, the American Association for Highway Improvement. There is a vast field in which to work, and there may be room for so many associations, but the movement for good roads is still in its youth and to the observer there is every indication of duplication of effort or else of special interest which may be served by the exploitation of an association.

MUNICIPAL ENGINEERING has had some opportunity of late to gather information about the various organizations and their conventions, and finds the serving of special interests too prevalent for pleasure or comfort. There can be no serious objection to such handling of the associations if the facts are known and those who attend their conventions and congresses are informed concerning them.

The recent convention of the first named association is reported to have been rather small and not well carried through so that this one may possibly be put out of consideration with the organizer and promoter.

The American Automobile Association is directly interested in the question of good roads and has been active in the promotion of the cause. It has done much good work and can do much more. The interested attendant of its good roads congress notes, however, a disappointingly small attendance and wonders whether its efforts in this direction would not be better placed if used in encouraging attendance at conventions and congresses of truly national and of state and district organizations.

The American Road Builders' Association mentioned has a considerable membership among state highway commissioners and state and national engineers and by its constitution seems to be sufficiently inclusive to cover the field, but practically the association itself is a rather close corporation showing no particular desire to extend its membership and operating its conventions as congresses, with delegates appointed with great prodigality who have no voice in the conduct of the association or of the congress.

The congress held in Indianapolis by this association is reported elsewhere in this number of MUNICIPAL ENGINEERING. It is said to have had a registry of something like 1600 delegates, but this report was not verified, access to the list not being permitted to those directly interested in the Indiana portion of the list, admittedly for the benefit of the special periodical interest represented by the secretary. Other reported occurrences confirm the opinion that this association is too largely in the hands of the special interest.

The facts do not detract from the value of the congress, which was addressed by a large number of those who are in the official organizations who have the construction and repair of state and county highways in their charge. The size of the delegation to the congress was largely due to the efforts of the Indiana Good Roads Association and others who are

preparing to present to the Indiana legislature bills which, if passed, will put that state in the line of progress in good roads. The proceedings of the congress were of much interest and value to these Indiana delegates as well as to those from other states, and created much enthusiasm for the cause in Indiana. Some of the criticisms above suggested must have reached the managers of the association, for, in a private session of "a few of the prominent members" there was some discussion of methods of extending its field. The most evident course of procedure would seem to be a divorce from the special interest and an active campaign for new members who would have an opportunity to exercise their rights of membership and would not be subject wholly to the dictation of star chamber sessions of a few members of the association or of the board of directors.

The last named association is but just formed and has not had an opportunity to demonstrate its principles. They are stated as follows by the newly elected president, Logan Waller Page, director of the U. S. Bureau of Roads, Department of Agriculture:

"The primary object of this association is to aid and promote every practical movement looking toward the improvement of public roads. There are already a number of county, state and general organizations which are doing good work along various lines, and I am glad to say that representatives of several such organizations are with us today. It is our hope that this organization will harmonize and correlate the work of all existing organizations.

"We shall supplement this work of correlation by endeavoring to bring about the organization of practical, working county clubs, which will turn their attention and their energies to improving county road administration, maintenance and construction; to uphold and strengthen the work of state associations for road improvement, and aid them in their efforts to secure wise and adequate legislation and competent and skilled supervision.

"The need of the day in road work is to take the administration of the roads away from the influence of politics; to insist upon skilled supervision of all road work; to remedy the evils of too much localization and to substitute uniformity and system for the confusion incident to pure localism as we now find it in some of the States.

"We hope to make the headquarters of this organization a clearing house wherein every movement of practical improvement will have a sympathetic hearing and earnest and helpful cooperation."

The character of the force back of this organization is shown by the names in the following list of officers and directors: President, Logan Waller Page; vice-president, W. C. Brown; treasurer, Lee McClung; secretary, J. R. Pennybaker, Jr.; organizer, W. D. Brown; directors—L. Hill, chairman; James McCrea, H. W. Finley, B. F. Yoakum, L. W. Page, Dr. E. J. James, E. D. Chapin, Bryan Lathrop, John Goodell, Melville E. Stone, Walter Page, Alfred Noble, Leonard Tufts, Lafayette Young, N. C. Brown, Joseph W. Jones, John A. Stewart, Leo McClung, James S. Harlan, Robert P. Hooper, George C. Diehl, A. G. Spalding, C. S. Barrett, Clarence Wilson, J. E. Pennybaker, Jr.

There is possibly room for a small technical organization of the state highway commissioners such as the American Road Builders' Association is in fact, but the plan of the new organization is so inclusive, and its efforts to correlate the efforts of the national and local organizations working in the same field is so helpful that, assuming the competence which the membership of the board of directors would seem to guarantee, it will become the truly national organization for which search has so long been made. Entangling alliances are particularly tabooed.

THE DES MOINES, INDIANAPOLIS AND BOSTON PLANS OF CITY GOVERNMENT.

As stated in the editorial note introducing the article on the commission and Indianapolis plans of city government, to be found on a preceding page, the new form of municipal government called the commission plan is under discussion in Indianapolis. The lack of understanding of what constitutes the commission form and the difficulty of separating from it the features which have been borrowed from other plans of city and state government, even by the best informed of the attorneys and others advocating a complete change in the form of government of the city, suggest the thought that others may not recognize the true relations of the various provisions which have been added to the original form of commission government, as well as those which, while included therein, were taken from other forms and are equally well appliable to any form likely to be devised.

The comparison of the Indianapolis and the commission forms is so well made by Mr. Mason in the article referred to that it will not be repeated here. Mr. Mason is an expert in city charters and shows his knowledge and judgment in the article.

Some of the points made by the chief exponent in Indianapolis of the commission form of government, Mr. Lewis A. Coleman, may be considered without too much repetition, however, and their relations to the plan as a whole may be demonstrated.

Mr. Coleman sets out five points in the commission form of government which, he thinks, make it a decided departure from the so-called federal plan, more properly the Indianapolis plan, since it was developed most completely in that city under the guidance of Mr. Mason and his associates in the work, and is the business plan and only incidentally resembles a federal plan.

The first point mentioned by Mr. Coleman is the complete abandonment of the nomination of candidates for office by political parties. This was not a feature of the first commission plan in Galveston, which provided for three commissioners appointed by the Governor of the state and two elected by the city. Election of all commissioners by the city was adopted because the first method was decided to be unconstitutional. The full development of non-partisan nominations was not reached until the Des Moines charter was formulated. It was one of the additions to the commission form of government, made first by the constitutional necessities of the case and second to eliminate partisan nominations as nearly as possible. That the principle can be applied independently of the commission plan is shown in the Boston charter. Indianapolis made a half-hearted attempt to diminish the force of partisanship by insuring that one-third of the council shall be of a party in the minority. That city can easily take the next step and apply fully the principle of non-partisan nominations, if it is willing to abandon the organizations of the political parties. The double election is a still further development in the same line which may be an advance and is applicable to the present Indianapolis form with equal ease.

The second point made is the abandonment of ward lines. This was a necessary feature of the original Galveston plan for a commission partly appointive, and of the subsequent desire to elect those who had been so appointed when their method of appointment was declared illegal. It was an accident, therefore, rather than a design, and may well be successful in a small or a compact city when it would not be in a large one, especially if scattered and made up of more or less disconnected districts. The experience of Boston in this line will be of interest.

The third point made is the merging of the legislature and executive functions in a commission. Many of the objections to this feature, which is the only distinctive feature of the commission form of government, are set forth in Mr. Mason's article on a

preceding page. This is the only provision which should be discussed under the title "Commission Form of Government." All other propositions are either borrowed from other sources or are developed to meet some difficulty in that plan, seen or feared. For lack of space no attempt is made here to present either side of the case regarding this particular proposition.

The fourth point presented by Mr. Coleman is the right of recall and the fifth covers the initiative and the referendum. These were of foreign birth and were discussed and tested long before the so-called commission plan was adopted by Galveston, and they were, in fact, engrafted upon the commission plan later, that the people might have some control of the commission, which, under the original plan, had very autocratic powers.

There are several other features that have been added to the original commission form, derived from various sources, such as separate election of mayor, instead of election of five commissioners who would select one of their number for mayor; separate nomination and election of each commissioner for his particular position on the commission; compulsory reference of franchises or contracts with public service corporations to vote of the people; publication of itemized statements of financial transactions and audit of all city accounts; separation of terms so that part of the commission changes each year; separation of schools and of parks from the commission proper, etc., which may quite as well be considered elements of the commission plan as the first, second, fourth, and fifth elements named by Mr. Coleman. They are no more essential to the commission form and differ only in being later developments and some of them in being less important. Whether they are better or worse is open to discussion.

It is not the purpose here to discuss the value of any of these numerous provisions nor their applicability in any particular case. That is reserved for the future. This article will have served its purpose if it has shown that but one of the provisions discussed, Mr. Coleman's third, can in any true sense be considered to be or to appertain to the commission plan of city government alone; that all the others are equally applicable to almost any other American form of city government, or can be incorporated therein by some modification of existing provisions, and that, therefore, it is not necessary to adopt the commission form of government in order to secure the benefits which the adoption of any of these other provisions may confer.

The fact is that, whatever the form of government, it is good in the hands of good people and bad in the hands of bad people. The majority of our municipal governments are in the hands of neither expert good people nor expert bad people, and their forms are so inefficient that the inefficient officers elected under them are, almost in spite of themselves, made more inefficient, if not even criminal.

The elements necessary to the average American municipal government seem to be home rule, so far as the adoption of plans for development, improvement and self-government are concerned; complete publicity, not merely by publication of thousands of agate lines of reports of proceedings, financial or otherwise, but through such expert investigations of conditions as are made by such an independent body as the finance commission provided for in the Boston charter; expert control, mainly through publicity, of technical operations, such as handling the public service industries, whether under public or private ownership, municipal accounting, etc., as now exercised through certain state commissioners; better methods of selecting competent men for expert technical services in the lines mentioned, probably to be developed through the demands of such state commissions for better service and the adoption of better salaries; more secure tenure of office of such employes, undoubtedly a consequence of the adoption of the preceding suggestions and of the short ballot, whereby the execu-

tive and legislative officer or officers are elected and all administrative officers are appointed under reasonable civil service regulations. Again the independent civil service commission provided in the Boston charter, is worthy of study. It exercises a minimum of authority over the appointing officers at the same time that it comes very near always providing competent persons from which they may select their employes.

Each city has quite as good government as its citizens deserve. All that the best charter can do is to make it as easy as possible for the people to assume control when they so desire, and as difficult as possible for the forces opposed to good government to cover their tracks and shift the responsibility for their acts. In almost any community publicity is almost the only necessity. This requirement was omitted from the Indianapolis charter and most of the complaints made of its municipal officials would have had no ground if those officials had known in advance that all ther acts and the consequences thereof would be recorded and the records thrown open for all to see.

THE QUESTION DEPARTMENT

Cost and Efficiency of Street Cleaning Methods.

Can you refer me to a good book of recent publication, or other reliable source of information regarding the comparative cost and efficiency of different street cleaning methods, particularly with reference to machine flushing?

E. W., City Engineer, ———, Mich.

The only book on the subject is Soper's "Modern Methods of Street Cleaning" ($3 net), which describes the methods in use in European cities and in New York. The figures for cost are nearly all very general in their nature, so that they are not of much value for application to any other locality, particularly under the different conditions in the smaller cities.

Some figures of cost of flushing streets in New York City, under high pressure, will be found in MUNICIPAL ENGINEERING, vol. xxxix, p. 316. This article states that 2 gallons of water were used per square yard of pavement cleaned, at 9 cents per 1,000 gallons, and the figures of cost are based on this statement. Another test made in three districts with street flushing machines and hand hose showed the following results, the figures for each type of machine being the average of two machines of that type. The first machine, the Connelly, used 0.343, 0.327, and 0.571 gallon per square yard of pavement flushed in each of the three districts respectively in which the experiment was tried. The second machine, the Sanitary, used 0.504, 0.588, and 0.642 gallon per square yard, respectively. The fire hose operated by hand by a gang of three men used 1.500, 1.795, and 1.699 gallons per square yard, respectively. The test on each district occupied 5 days in August. Meters were used in determining the amount of water used in the third district. These figures for use of water would reduce somewhat the estimate of cost made in the above named article.

The following data are drawn from various sources:

CHICAGO, ILL.

A Chicago citizens' bureau carried on street cleaning for a time, some four to six years ago, and stated that the cost of cleaning by hand sweeping was 86.7 cents per 1,000 square yards per day for granite blocks and 60.5 cents per 1,000 square yards per day for asphalt. The area was swept 2½ times each week day and once on Sunday, or an average of 2.3 times per day, so that the cost for each sweeping would be 37.7 cents per 1,000 yards each time for granite and 26.3 for asphalt. An interesting development is that the number of men required for sweeping varies directly as the tonnage of traffic. Cost of removal and disposal of street sweepings is not included in the Chicago figures.

DAYTON, O.

The special report of the U. S. Bureau of the Census on statistics of cities for 1907, gives figures of average cost of street cleaning and details of amounts cleaned by hand sweeping, machines and flushing, classified by cleanings per week. All the 44 cities given, but Dayton, O.,

use two or more methods of cleaning, so that the cost of different methods of cleaning can not be compared. The cost for machine cleaning in Dayton is 56.5 cents per 1,000 square yards, each cleaning.

ST. LOUIS, MO.

J. C. Travilla, street commissioner of St. Louis, Mo., supplies the following:

The average cost of cleaning streets per 1,000 square yards each cleaning is as follows, no charge being made for water:

Flushing	$1.00
Squeegees	0.45
Machine sweeping	0.81
Hand sweeping	1.58
Patrol system	0.25

For cleaning alleys the figures are:

Flushing	$1.94
Hand sweeping	1.70

The flushing system is used on granite block, vitrified brick and sheet pavements. There are eight crews made up as follows:

4 flushers at $7	$28.00
12 laborers at $1.50	18.00
4 mud wagons at $4	16.00
2 inspectors at $3	6.00
Total cost per day	$68.00

Two inspectors are required. One is in charge of the 4 flushers and 4 laborers, 2 of whom keep the sewer inlets screened and free from rubbish and 2 follow the flushers, brooming the water down the gutters and off the street crossings. The other inspector has charge of 8 laborers and the 4 mud wagons. Flushing on sheet pavements costs but little more than cleaning with the squeegees.

The squeegees are used only on sheet pavements. There are 2 crews made up as follows:

1 sprinkler at $5	$ 5.00
2 squeegees at $7	14.00
2 pick-up wagons at $4	8.00
4 laborers at $1.50	6.00
1 inspector at $3	3.00
Total cost per day	$36.00

Machine sweeping is done by 4 crews made up as follows:

1 sprinkler at $5	$ 5.00
2 machine brooms at $5	10.00
12 laborers at $1.50	18.00
6 pick-up wagons at $4	24.00
2 inspectors at $3	6.00
Total cost per day	$63.00

One of the inspectors is in charge of the sprinklers and machine brooms and the other looks after the laborers and pick-up wagons.

There are 8 crews doing hand sweeping and scraping, consisting of the following:

12 laborers at $1.50	$18.00
2 pick-up wagons at $4	8.00
1 inspector at $3	3.00
Total cost per day	$29.00

Under the patrol or "white wings" system there are an average each of 309 patrolmen employed per day at $1.50 each, with 1 inspector at $3.50 a day to every 19 patrolmen, and 1 pick-up wagon at $4 a day for every 6 patrolmen. The minimum area given 1 patrolman is 2,000 square yards, the maximum 11,000, and the average 6,000.

Alley flushing requires 6 crews made up of:

2 flushers at $7	$14.00
6 laborers at $1.50	9.00
2 mud wagons at $4	8.00
1 inspector at $3	3.00
Total cost per day	$34.00

The city is divided into 4 cleaning districts in charge of district superintendents at $85 a month, who report to a general superintendent, at $150 a month, in charge of all the work. A man is in the general superintendent's office at all times to receive the reports of superintendents and inspectors, which are telephoned in twice a day, and to take care of the daily written reports of inspectors as to force employed, etc.

The lengths and areas of streets cleaned are as follows:

	Miles.	Sq.Yds.
Asphalt	59.46	1,245,332
Bitulithic	38.69	807,249
Granite block	70.02	1,334,318
Wood blocks	3.26	61,901
Vitrified brick	142.02	2,742,450
Totals	313.45	6,191,250

The alleys amount to the following:

	Miles.	Sq.Yds.
Granite blocks	8.89	85,325
Vitrified brick	113.58	1,085,555
Granitoid	1.31	11,528
Limestone	60.92	537,022
Totals	184.70	1,719,430

Pavements in the business districts are cleaned twice a week at night and in the residential districts once a week, alleys about twice a month, some machines running day and night. These facts must be considered in comparing the cost per square yard of cleansing streets and alleys and in making comparisons with other cities.

In winter 11 snow traps or dumps, cost averaging $365 each, are installed over large sewers, providing short hauls for snow removal. In the central retail business district 25 stations are established as centers for report of inspectors, laborers and teams after each fall of snow, so as to reduce the time of snow removal to a minimum. The cost of this removal is about 16 cents a cubic yard.

ALBANY, N. Y.

Streets are swept twice a week by machine for 8 months of the year at a total daily cost of $153.40, not including cost of dirt removal, or 42 cents per 1,000 square yards. The cost of dirt removal, done by contract, increases the cost, apparently, to about 55.5 cents per 1,000 square yards.

CLEVELAND, O.

Average cost for street flushing by ma-

chine by city's machines 44 cents per 1,000 square yards in 1908.

SCRANTON, PA.

Annual report of department of public works for 1908 states that hand cleaning cost 30.7 cents per 1,000 square yards, machine sweeping cost 18.2 cents, and flushing cost 20 cents, all these figures including labor of cleaning only.

NEW YORK CITY.

The special commission appointed to investigate cost of street cleaning made detailed estimates of cost of street cleaning, the final result of which is a statement that hand sweeping should cost 28.1 cents per 1,000 square yards, machine sweeping 31.7 cents, flushing by hose with special nozzle 25.1 cents, flushing by hose with ordinary nozzle 31.9 cents, and flushing by machine 72.1 cents, being the figure given in the article on p. 316, vol. xxxix. These figures seem to have been those of 1907, in which is also included the cost of cleaning with squeegee as 20 cents per 1,000 square yards.

AVERAGE COSTS.

A paper before the American Society of Municipal Improvements in 1906 gave the average costs in 13 American cities as 75.3 cents per 1,000 square yards for machine cleaning, 24.5 cents for hand cleaning and 31.8 cents for flushing.

BOSTON, MASS.

The report of the street department for 1909 shows that the cost per 1,000 square yards cleaned once is 32.6 cents for flushing; 43.1 cents for machine sweeping of paved streets; $1,199 for gutters, or an average of 49.8 cents for streets and gutters combined.

Additional data with figures for contract work in Indianapolis, New York, Washington, Hartford and other cities using various methods will be found in MUNICIPAL ENGINEERING, vol. xxxviii, p. 193, with references to many previous articles on the subject, giving further details, which give more information than can be obtained from any other one source.

Railways and Snow Removal.

Will you kindly inform me what street car companies are usually required to do toward taking care of snow on city streets? The electric railway here has been using a snow plow which shoves the snow to the side of the street a sufficient distance to leave a narrow driveway each side of the track. This driveway is so narrow, however, that there is barely room for a team or vehicle to pass between the banked snow and a passing car, and there is considerable worriment among teamsters and others on their account.

I presume this is a question on which the laws of different states would differ, and it would also probably be affected by the form of franchise, but no doubt you can at least tell me what is the usual condition.

Any information along this line will be very much appreciated.

E. R. W., Port Huron, Mich.

If the franchise granted the company is silent on this point, it can probably be controlled by city ordinances exercising the police powers of the city. Custom is quite variable in this respect. Too many street railway franchises are silent upon this subject, even in the northern cities, where snow removal is a serious problem.

Elgin, Ill., provides that "in removing snow from its tracks the said company shall distribute it so that it will not impede public travel on the streets occupied by its tracks."

The Moline, Ill., ordinance provides that the street railway company "shall keep their roadways free and clear from snow and dirt, so much as may be occupied by its said tracks and right-of-way and turnouts, and shall cause the snow and dirt or street cleaning to be removed, so as in no wise to interfere with the free use of the avenues or streets by the public in all cases."

The Hammond, Ind., ordinance provides that "in the event that the said company shall at any time cause the snow to be removed from its tracks, it shall be disposed of in such manner as not to interfere with travel by private conveyance."

The corresponding provision of the Dayton, O., franchise governs street cleaning and may possibly be construed to cover snow removal also. It is as follows: "Said company shall keep clean and free from dirt so much of said part of such streets and intersections adjoining as lies between the parallel lines drawn and extending eighteen inches outside of its tracks, and, in case said part of such track shall be paved, said transit company, its assigns or mortgagees, shall cause the dirt and street sweepings to be removed along the line of said road and place the same in heaps, and to so remove the same as not to interfere with the free use of such street by the public; or the city of Dayton, at its option, may clean and remove the dirt from said part of such streets from the space between the rails and tracks and for eighteen inches outside the outer rails, and in case the city shall do such cleaning and removal of dirt, said company shall pay to the city the reasonable cost thereof, provided such cost shall not exceed that of cleaning and removing the dirt from the rest of the street; and while said part of such street remains unpaved, said company shall pile and remove the dirt and street sweepings from along its said tracks in the same manner as is provided above in the event of paving. Said company shall pay the cost of sprinkling the space between lines parallel to and eighteen

inches outside of its outside rails on said part of such street and intersections adjoining."

Such provisions as the following from Rome, N. Y., may be made to cover the case in absence of anything more definite: "The said company, its grantees, lessees, assigns, successor or successors, shall and will at all times indemnify and well and truly save, keep and bear harmless the city of Rome, of and from all harm, let, trouble, damages, costs, suits, actions, judgments and executions that shall or may at any time arise, come or be brought against or by any person, persons or corporation, for or by reason of any neglect, want of care or skill, negligence of omission or commission in the construction, maintenance, management, repair or operation of said road or its equipment or the repair of the streets aforesaid in any form or manner, either by said company, its agents or servants, or its grantees, lessees, assigns, successor or successors."

Lacking any ordinance, it is probable that the police powers of the city could be invoked in case of serious interference with traffic or danger to persons or property.

The following from the superintendent of a New York state street and interurban railway, for which snow is as great a problem as it is for Port Huron, will give some ideas on the subject for use on streets where it is not necessary to haul all the snow off the street:

Many roads, having an average passenger car headway of seven and one-half minutes to ten minutes, do not often have the number of plows or sweepers required to maintain over the system a headway of even sixty minutes. This fact, together with climatic conditions, renders the problem of snow removal in our smaller cities and towns, and also in all cities and towns of Northern and Western New York, one of serious importance.

With us it is a question of ways and means; a question of number and types of plows, of capacity of rotaries, of strength of sweeper brooms, of means of throwing the snow over banks, from five feet to fifteen feet high, and of providing electric power to operate both plows and cars.

In our towns we cannot haul all the snow off the streets, because there is too much to possibly handle; we, therefore, confine our efforts in this respect to the business centers, crosswalks and junction points. Along the remainder of the lines the snow is piled up between curb and walk, or spread between track and curb, as the locations warrant. The snow we do remove is hauled away in sleighs, and sometimes on flat cars.

In considering our snow-fighting equipment we find that all types of machines for removing snow are useful. We even require horse-plows or walkaways for leveling back banks of snow thrown out by the plows and for cutting down drifts and opening gutters—work which cannot always be readily done by a track-plow.

In localities where winter commences early in December and lasts until April, where storm follows storm, and where a "thaw" means a rise in temperature slightly above 32 degrees, and closely followed by more snowstorms, severe cold and usually high winds, the accumulation of snow from one storm almost never disappears before it is buried beneath another. In the outskirts of the cities and on the suburban lines, the high winds continuing for days are the cause of most of the trouble, as huge drifts of hard sandy snow are formed as rapidly as removed, and successfully defy ordinary snow-plow apparatus.

To combat our local conditions we have drifted away from rattan brooms and followed, more or less intelligently, modern steam road practice. First, we dragged a board along the track; but finding this little better than our sweepers, we placed the board ahead and shoved it along. The board soon changed its form from a vertical plank, placed diagonally across the track, to a warped-surface shear, tending to cut, lift and then roll a mass of snow along its length.

Finding this snow-plow ineffective in banks over five feet or six feet high, an ingenious friend produced an electrically-driven boring machine, and called it a rotary track cleaner. With this machine we are able to cut our way slowly but surely through banks of snow of almost any depth and of any condition, short of hard ice.

We have, also, placed upon all our passenger cars track cleaners or scrapers, which will, without difficulty, remove snow from the rails to the depth of four inches, unless the snow has been packed down to this depth by the street traffic; and it may be well to say that scrapers which will remove even hard-packed snow are in use in Toronto and elsewhere.

Each type of plow has its place and cannot economically be used in any service for which it is not adapted. It is as improper to attempt to remove six inches of snow with a rotary as to attempt to cut through two feet of snow with a rattan sweeper. In either case the feat may be accomplished, but in neither case with the greatest economy.

Considering the removal of snow in cities, it may be said that experience in Western New York has shown that, with the equipment at hand, the work should be performed about as follows:

On the appearance of a snowstorm, when the streets are free from snow, light plows and sweepers should be gotten in readiness and should commence work when not more than about two inches have fallen. If the storm continues and the snow falls so rapidly that there is a probability that the accumulation between trips of the plows and sweepers will exceed three inches, the heavy shear-plows are sent out. When the ridges formed by the plows and levelers approach twenty-four inches in depth, walkaways are used to level off the same, and shovelers are sent out to clean all crosswalks. At the commencement of a storm a force of trackmen are sent out to clean switches.

In storms of recent years, when snow has fallen to depths of over thirty inches, it has been found impossible to depend upon the light plows and sweepers to do more than follow after the heavy plows, and to clean the street to the pavement. The work of the rotary commences when the banks of snow on either side of the tracks become so high that the plows can no longer shove them back.

The rotary is a slow-moving machine, because of the power limitations of the ordinary street car motor, but its work

is positive and effective. As our storms are usually accompanied or followed by high winds, the new-fallen snow is soon piled in drifts in the thinly settled portions of the city. The snow thrown out by the rotary is spread over a large surface and does not materially add to the height of the bank until the snow has become wind-packed and sandy, and then, for the reason stated, the height of the bank is only slightly increased. Teams and shovelers commence the removal of snow at junction points as soon as it accumulates. When the storm is over the work of removing the banks of snow in the business section, thrown up by the plows and from the sidewalks, is undertaken by the railway and city forces jointly.

When the storm ceases our work has just fairly begun. Although there remains little to be done in the centers of the city, drifts are being rapidly formed in the outskirts, and plows and rotaries must remain in constant operation for days to keep the lines open.

The Rochester snow-plow equipment consists of eight antiquated sprocket-driven mold-board plows, equipped with Westinghouse No. 3 motors, three combined rattan sweepers, one double track four-motor Wason nose plow, one double-end tin fan rotary, two single truck shear-plows and six walkaway or horse-plows. With this equipment was kept open, throughout the severe storms of last winter, 100 miles of track, including twenty-five miles of side or boulevard track, placed between rows of trees on one side, with less than ten feet betwen the two. This peculiar location of tracks renders the use of wings or levelers impossible, and the snow is therefore soon piled up close to the tracks and the cars are operated in a cut, the width of the car body. Under these conditions the removal of snow is made difficult and expensive, and because of the narrow space between rails and sidewalk the number of shovelers and the expense of snow is greatly increased. The cost of removal of snow and ice for the winter of 1901-1902 in Rochester was $90 per mile, a large percentage of which may be attributed to the twenty-five miles of boulevard tracks.

When the average life of a rattan-filled broom is considered, as with its extreme flexibility, the additional cost of a steel broom, properly reinforced by steel plates, is more than made up. Those who have operated steel brooms, driven by fifty-horse power motors, know that they will cut through drifts of moderate depth and sweep the track clean, with no apparent injury to the brooms. For comparison it may be well to state that the steel brushes cost $42 per set, and last from two to five years with ordinary care. A sweeper thus equipped will readily go through two feet of loose snow and at good speed, and will cut all packed snow to the pavement, when properly operated.

Reduction of Garbage.

I am seeking information regarding processes of converting garbage into fertilizer.

In August *Pearsons,* page 159, mention is made of Paul Bruet, a German, in London, who began burning garbage in large vertical cylinders, surrounded by steam jackets, and evaporated the 75 per cent of water in the garbage. The fatty substances were dissolved, and as a result of the process a fertilizer worth $15.00 per ton.

The incinerator built for this city was a failure for the teams drove up an incline and dumped load down chute. After a few loads everything was choked up, no heat could reach the interior of all those slushy loads, and now the garbage is fed to pigs outside of city limits. The approximate quantity is 400 tons per day.

Every one is dissatisfied with past and present means of disposing of this matter, and if I can start up a business to use this matter at a profit I intend to do so, and any information you can give me will be received gratefully.

Considering the large number of days here when the sun is on the job, I believe a long building with a moving platform and glass sun reflectors overhead would be both successful and economical for sunshiny days of spring, summer and fall. But I do not intend to experiment until I get experienced, practical advice.

M., Los Angeles, Cal.

This is too large a problem to be attacked at long range, and in the limited space available in this department.

The description of the London experiment is very imperfect and incorrect, but indicates that Mr. Bruet is trying a process in England, where destruction of garbage has long been almost the only method of disposing of it, which is very similar to some of the methods of reduction of garbage which have been developed in this country, where the reduction plan has been quite popular, especially in the larger cities. Reduction processes extract the grease from the garbage, more or less completely, and produce a comparatively dry "tankage," which is used as the base for making fertilizers. Almost none of the operators of such plants claim profits. In fact, they have almost always combined the collection and reduction of garbage in a single contract, and have required a considerable payment from the city for the double work on the statement that otherwise they could not make a profit. Two cities now collect and reduce their own garbage—Cleveland and Columbus, O.—and we may soon know more of the facts in the case. Both now claim profits from the reduction, not including the collection, but their claims have not yet been substantiated to the satisfaction of all the expert observers. There is a reasonably good profit in the reduction of dead animals, and one developer of reduction plants of long and varied experience makes the definite statement that there is no chance for profit in a reduction plant unless all the

"good" garbage, including that from hotels, and all the dead animals are delivered to the plant.

In any particular city the quality of the garbage, the method of collection, the proportion of grease, the number of dead animals and the local influences on cost of operation must be known in order to make any estimate of the returns and the profits.

The description of the operation of the incinerator would indicate that the trouble with the incinerator was not so much with the plant as with the operation of it. Very probably it was seriously overloaded, and there is no worse failure imaginable than that of an overloaded garbage destructor. There is some chance for an overloaded steam plant to stagger through for a while, but none whatever for a garbage plant. There are several very satisfactory incinerators and destructors in operation in this country, and many more in England. The reported bad management of the garbage delivery station to an outsider is a suggestion of ignorance or incompetence in manage of the whole garbage problem in Los Angeles.

The writer is not at all sure that feeding to pigs is not the best solution of the problem for Los Angeles, provided the matter is in the hands of large operators, and is not distributed about among small farmers and irresponsible herders. Denver reports the best of success under this plan, due largely to the close supervision and competent care of the matter by the Board of Health and the contractors, the concentration of the business, and even more largely to the climate, which makes it so much easier to get the garbage to the feeding places in good condition.

The drying of the garbage which seems to be proposed in the later sentences would not prepare it for use as fertilizer. It would make the material easier to burn, and, if the fumes were properly consumed, or the plant were far enough from habitations would not, perhaps, become too serious a nuisance in the dry season at Los Angeles, and possibly not at any season.

The quickest way to dispose of the garbage is to bury it, and in the climate of the Mississippi Valley it then becomes an indistinguishable part of the soil in about two years. Whether the dryer climate of Los Angeles would change this action the writer could not say without further information.

It is hoped that enough has been said to demonstrate the difficulty of the problem and the necessity of expert study of the special conditions of the locality, before selecting any method of garbage disposal.

The intimate relation of city refuse collection and garbage disposal is shown in an editorial in the October number of MUNICIPAL ENGINEERING, vol. xxxix, p. 286.

Specifications for Electric Lighting Contract.

This city is contemplating the letting of a contract for street and commercial electric lighting, and if you could refer me to articles or books dealing with specifications for such electric lighting, they would be very useful to me in drafting our specifications.

W., ————, Ind.

There are now many systems of electric lighting and their efficiencies and economies depend to a considerable extent upon the work to be done, so that specifications which will apply to one city will not apply to another. The advancement in electric lighting is so rapid that no book can be kept fully up to date. MUNICIPAL ENGINEERING has discussed most of the provisions of such a contract, and reference should be made to the following articles:

"Some Provisions in Modern Franchises for Municipal Service Utilities" in vol. xxxix, p. 456, gives some important provisions for such a contract, particularly those providing for future modification of rates. This provision is already made use of under one of the franchises or contracts mentioned in the article.

"Number and Cost of Electric Lights," vol. xxxix, p. 37, gives a list of many previous articles which will be of great value in comparing prices for electric lights of various kinds and for various services in many cities. Several of these articles are in vol. xxxviii, on pp. 107, 186, 169, 186, 187, 249, 330, and are directly to the point.

The contract for ornamental lighting of the business streets of Indianapolis is given in vol. xxxix, p. 50, and may be of interest in this connection.

Other articles in vol. xxxviii of direct application are "Co-operative Franchises for Municipal Public Service Corporations," p. 335; "Factors That Should be Considered in Making Street Lighting Contracts," p. 393; "Cost of Operating Street Lighting System," and "Excessive Rates for Water and Electric Light," p. 417; "Street Lighting," p. 15; "Arc and Other Electric Lights," p. 44; "Distribution of Charges for Electric Power," p. 108; "Cost and Efficiency of Electric Power," p. 266; "Expediency of a Municipal Electric Light Plant," p. 416.

If further investigation is desired, some of the above-named articles give references to articles in previous volumes.

Electric Light Franchise.

Can the twenty-fifth annual report of the Illinois Society of Engineers and Surveyors be obtained, and from whom?

I would like to get a copy of a good progressive electric light franchise, one containing the whole ordinance. I read the articles with interest in MUNICIPAL ENGINEERING on municipal subjects, and have a copy of Wilcox's "Municipal

Franchises." I have also read the article mentioning the Taylorville light ordinance. B., Bowling Green, O.

The proceedings of the Illinois Society of Engineers and Surveyors can probably be obtained from E. E. R. Tratman, secretary, Monadnock building, Chicago, Ill., at a cost of 50 cents.

No one form of franchise will suit the conditions of two towns in different states and even slightly different physical conditions. There are so many points of difference in customs, requirements, demands, forms of doing business, legal restrictions, and many others, that each franchise must be built for its particular duties. The best procedure, therefore, is to take such articles as "Factors That Should be Considered in Making Street Lighting Contracts," in MUNICIPAL ENGINEERING, vol. xxxviii, p. 393; "Cooperative Franchises for Municipal Public Service Corporations," p. 335; "Some Provisions in Modern Franchises for Municipal Public Service Utilities," vol. xxxix, p. 456, and others referred to therein, and develop a franchise which will suit the local conditions. If there is one already in existence it may be necessary to use that one as the basis for the new one. A franchise for another city can be taken only as an example of what that city has been able to do under its peculiar conditions. A second franchise for another public service corporation is now being put in shape in Taylorville, Ill., which is more comprehensive than the one referred to by our correspondent, because it covers electricity, gas and heat, and when it is completed it will be printed. Meantime can any of our Ohio readers, or those from other states, send copies of their electric light contracts or franchises with comments as to the provisions they think bad as well as those which are good?

The preparation of a franchise or contract with a public service corporation is the most important act of a city council, and should not be undertaken without the fullest and most public discussion and all the expert aid which can be made available.

Gas Processes and Rates.

Will you kindly give me such information as you can as to what is an average or fair rate to be paid to manufacturers of gas, or to be reserved to the manufacturers in a franchise to be granted by a city of this size, viz., 5,000 people?

An exclusive franchise is asked and the right to charge certain rates, to both private consumers and the city, is to be reserved to the manufacturers under the franchise.

I will appreciate any information you can give me along the lines as to what is a fair rate.

Please quote both ways, where the gas is to be manufactured from coal and from crude oil. P. G. E., City Attorney,
———, Colo.

This is a question which requires detailed study in order to give a reply which will be just to both company and consumers. The cost of the plant is an important item, and this will depend upon the process chosen, the probable capacity required, the density of the population using the gas, which may be expressed in cubic feet of gas consumed per day or year, per mile of mains, etc. Judgment as to probable rate of increase in patronage, number of consumers per mile, whether gas will be used for both lighting and fuel or for both, etc., must be exercised carefully if a single rate is fixed.

Cost of coal or oil, wages, cost of management, interest on cost of plant, allowance for depreciation, must all come into the daily cost of maintenance and operation.

Under expert state supervision of public service corporations it is possible to fix rates which will be fair to both sides. If they are not right at any time, on account of errors in first determination or on account of changes in conditions, the state commission can call for the accounts of the company, take evidence on both sides of the case and fix the rate accordingly.

Where there is no such state commission it has not been customary to require a company to show its books to the local authorities, although, in making a contract, the council has the right to insert such a provision. In some cases, such as those mentioned in the article on another page on "Some Provisions in Modern Franchises for Public Service Utilities," this examination of books is put in the hands of an expert commission appointed in such manner as to be independent and unbiased.

Another method of fixing rates would be to compute for an assumed small beginning consumption of gas the proper rate to give the company a just return on the capital invested, including all items of construction, working capital and legitimate expense. Then compute the rates for assumed larger consumptions and insert in the franchise a proviso that the rate shall be a fixed amount until the consumption reaches a certain figure, when it shall be reduced to a given rate, such reductions being made according to a schedule fixed in the franchise as the consumption increases. To secure rates which will be at all times fair to both manufacturer and consumer, the advice of one experienced in this line should be sought.

The writer would not venture to suggest a rate without full knowledge of the local conditions. One small city may be able to secure a rate of, say $1.25, when another city of like size would put its company into bankruptcy by reducing the oven processes produce gas the cheapest, but where the consumption is small and even the smallest practicable plant can not be operated all the time, the water rate below, say $1.75.

It is probable that water gas would be the cheapest for a city of this size and location, although a large consumption of gas for fuel or a low price for coal might reverse the statement. In large quantities, and where the residuals of manufacture can be disposed of advantageously, the coal gas and some coke gas process has an advantage even without residuals to sell as by-products. In many cases of cities somewhat larger than that of our correspondent a combination of the two processes produces the best financial results.

Some of these problems have been discussed in MUNICIPAL ENGINEERING in such articles as the following:

In vol. xxxxix: "A Bill to Control Gas Companies in the District of Columbia," p. 51; "Enlargement of Municipal Gas Plant at Westfield, Mass.," p. 132; "Investigation of Washington Gas Cost," p. 133; "Determining Minimum Charge for Gas," p. 222; "Flow of Gas in Pipes," p. 310. The various processes of making gas and their applicability to a city of somewhat larger size than the above are discussed on p. 389.

In vol. xxxviii: A list of books on gas making is given on p. 107, also one of a few articles on gas. Another list will be found on p. 188. The principles underlying some proposed new franchises are discussed on p. 315, and they may be applied to a gas franchise although none of those mentioned are for gas or lighting companies.

In vol. xxxvii: An article on "Municipal Gas Plant Experiences" on p. 315 gives pointers of some value.

In vol. xxxvi: "Quality of Gas," p. 286.

In vol. xxxv: "Books on Gas Manufacture," p. 35; "Principles Underlying a Street Lighting Contract," p. 96. "A Modern Municipal Franchise," p. 306, gives the provisions in the latest contract in Indianapolis with a gas company, which is able to make money on a 60-cent rate.

In vol. xxxxiv: A list of previous articles on gas rates and costs, p. 29; "Effects of a Reduction in the Price of Gas," p. 144; "Ownership of Gas Meters and Service Pipes. p. 370.

The following list of gas rates in cities of about 5,000 to 10,000 population will show the variations but not the full reasons for them:

City and Process.	Coal cost per ton.	Oil cost per gal.	Prices for Gas. Light. Gross.	Light. Net.	Fuel. Gross.	Fuel. Net.
ALABAMA.						
Anniston, coal	$2.20	....	$1.50	$1.40	$1.10	$1.00
Eufaula, coal	3.20	....	1.75	1.58	1.50	1.35
Florence, coal	3.00	....	1.65	1.50	1.65	1.50
*Talladega, coal	2.25	....	1.50	1.25	1.50	1.25
ARIZONA.						
Douglas, Beale crude oil	....	3.928	....	1.50	....	1.50
ARKANSAS.						
Helena, coal	3.37	....	2.50	2.00	....	1.25
CALIFORNIA.						
Anaheim, Beal crude oil	....	5.5	1.50	1.25	1.50	1.25
Bakersfield, Lowe crude oil	....	$1†	2.00	1.50	2.00	1.50
Chico, Lowe crude oil	....	2.5	....	1.50	....	1.50
Covina, Western oil	....	90†	1.50	....	1.50	....
Grass Valley, Lowe crude oil	....	3.6	....	1.50	....	1.50
Hanford, W. C. Con. Co. oil	....	2.15	2.00	1.75	2.00	1.75
Long Beach, New Lowe crude oil	..	....	1.25	1.00	1.25	1.00
Marysville, Lowe crude oil	....	2.4	....	1.50	....	1.50
Modesto, New Lowe crude oil	....	$1.05†	2.00	1.90	1.50	1.40
Monrovia, Lowe crude oil	....	....	1.50	1.35	1.50	1.35
Napa, Lowe crude oil	....	2.4	....	1.50	....	1.50
Oroville, Lowe crude oil	....	....	2.50	2.00	2.00	1.50
Oxnard, Lowe crude oil	....	1.55	....	1.25	....	1.25
Palo Alto, Lowe crude oil	....	....	....	1.50	....	1.50
Pomona, Lowe crude oil	....	....	1.10	1.00	1.10	1.00
Redding, Lowe crude oil	....	....	....	1.50	....	1.50
San Pedro, Lowe crude oil	....	....	1.50	1.35	1.50	1.35
San Rafael, Lowe crude oil	....	2.4	....	1.50	....	1.50
Santa Ana, Lowe crude oil	....	....	....	1.00	....	1.00
Santa Clara, Lowe crude oil	....	2.38	1.50	1.25	1.50	1.00
Visalia, W. G. C. Co. oil	....	2.5	2.00	1.50	2.00	1.50
Watsonville, Lowe crude oil	....	....	....	1.50	....	1.50
Whittier, Lowe crude oil	....	....	1.50	1.35	1.50	1.35
COLORADO.						
Canon City, Lowe crude oil	4.45‡	3.5	2.00	1.50	1.25	1.25
Ft. Collins, P. English oil	3.25	4	....	1.50	....	1.00
Grand Junction, coal	3.10	....	1.60	1.52	1.60	1.52
Greeley, coal	4.55	....	1.75	1.50	1.75	1.00

*Municipal plant.
†Per bbl.
‡Price of coke per ton.

City and Process.	Coal cost per ton.	Oil cost per gal.	Prices for Gas. Light. Gross.	Light. Net.	Fuel. Gross.	Fuel. Net.
CONNECTICUT.						
Bristol, Lowe	5.85	....	1.60	1.50	1.60	1.00
Putnam, Lowe	6.10	3.8	2.00	1.65	1.35	1.25
Rockville, Lowe	....	....	1.60	1.30	1.60	1.30
Wallingford, Lowe	....	5	....	1.50	....	1.50
West Winsted, Lowe	6.75	....	1.60	1.50	1.60	1.50
FLORIDA.						
Gainesville, Sutherland	6.00	4	2.25	2.00	2.00	1.80
Miami, Logan & Janeway	....	4.5	....	1.50	....	1.50
Ocala, Lowe	7.60	3.67	2.00	1.90	1.50	1.40
Orlando, coal and Lowe-Granger	4.75	3.75	....	2.00	....	1.60
St. Augustine, Lowe	....	....	1.60	1.50	1.60	1.50
GEORGIA.						
Brunswick, coal	....	....	2.00	....	1.50	....
Cartersville, coal	2.50	....	....	1.25	....	1.25
Dalton, coal	2.25	....	....	1.00	....	1.00
Valdosta, coal	....	....	2.00	1.50	2.00	1.50
IDAHO.						
Lewiston, coal	5.70	....	2.25	2.00	2.25	2.00
ILLINOIS.						
Beardstown, coal	4.50	....	1.50	1.35	1.50	1.35
Belvidere, Lowe improved	5.15‡	2.85	....	1.20	....	1.20
Canton, coal	4.10	....	2.00	1.25	1.50	0.90
Clinton, coal	3.89	....	1.25	1.25	1.25	1.25
Dixon, coal	4.25	....	1.25	1.15	1.25	1.15
Du Quoin, coal	1.50	....	1.50	1.25	1.50	1.25
Galena, coal	....	....	....	2.00	....	2.00
Litchfield, Kendall oil	....	2.5	2.00	1.50	1.50	1.35
Macomb, Lowe	5.95‡	3.125	1.50	1.25	1.50	1.00
Mendota, coal	5.00	....	1.40	1.25	1.40	1.25
Morris, Lowe and Sutherland	5.00‡	2.85	1.50	1.50	1.50	1.50
Mt. Carmel, Lowe	....	2.65	1.10	1.00	1.10	1.00
Murphysboro, Lowe	....	....	1.50	1.25	1.50	1.25
Pontiac, coal	....	....	1.25	1.19	1.25	1.19
Princeton, coal	4.10	....	1.50	1.25	1.50	1.25
Taylorville, Lowe	....	....	2.00	to		1.25
INDIANA.						
Aurora, coal	2.00	....	1.50	1.25	1.50	1.00
Bedford, coal	....	....	....	1.00	....	1.00
Connersville, coal	3.00	....	1.50	1.15	1.50	1.15
Crawfordsville, coal and Lowe	3.45	....	1.50	1.20	1.50	1.20
Franklin, coal	....	....	....	1.10	....	1.10
Goshen, coal	2.85	....	1.25	1.00	1.25	1.00
Huntington, coal	....	....	....	1.25	....	....
Lawrenceburg, coal	3.00	....	....	1.25	....	1.25
Madison, coal	3.05	....	1.65	1.50	1.10	1.00
Martinsville, Lowe	4.00‡	3.4	1.35	1.00	....	....
Plymouth, Lowe	2.65‡	3	1.35	1.25	1.35	1.25
Rochester, coal	3.15	....	1.35	1.25	1.35	1.25
Rushville, oil	....	....	1.60	1.50	....	....
Seymour, coal	....	....	1.50	1.25	1.50	1.25
Valparaiso, coal and Lowe	3.25	3.5	1.50	1.25	1.50	1.00
Warsaw, coal	3.15	....	....	1.00	....	1.00

Rails for Street Car Tracks.

Will you kindly give me some information as to the relative merits of Tee rails vs. the Trilby rails and also a list of cities in which the Trilby rails are used?
P., City Engineer, ———, Cal.

It seems to be generally conceded now that for permanence of construction a depth of rail of some 7 inches is necessary. Nine-inch rails have been used successfully in some cities, but if heavy interurban cars are run over them they must be so heavy that they are unduly expensive, otherwise there may be the complaint reported from Indianapolis that the web was so light that a lateral motion was apparent under the heavy cars.

This, or its equivalent, conceded, the question becomes one of the form of the surface of the rail and the laying of the pavement against it. There are many differences of opinion as to which is the best, probably because not all consider at the same time the relations of the form of rail surface to the form of paving adopted.

The T-rail is used to greater or less extent in such cities as Dayton, O., Davenport, Iowa, Delaware, O., Denver, Col., Erie, Pa., Indianapolis, Ind., Kansas City, Mo., Milwaukee, Wis., Minneapolis, Minn., New Haven, Conn., St. Paul, Minn., Schenectady, N. Y., Scranton, Pa., Tacoma, Wash., Terre Haute, Ind., Amsterdam, N. Y.

The girder rail is used in such cities as Syracuse, N. Y., Baltimore, Md., Brooklyn, N. Y., Buffalo, N. Y., Cambridge, Mass., Cleveland, O., Detroit, Mich., Louisville, Ky., New York, N. Y., Richmond, Va., Rochester, N. Y., Springfield, Mass., Washington, D. C., Waterbury, Conn., Worcester, Mass., Columbus, O., Chicago, Ill., as well as most of the cities in the former list. Many of these cities use grooved rails, but some use a flat tread.

Track construction in Indianapolis for some of the interurban service with 7 and 9-inch T-rails and brick pavement along the tracks, is described in articles in MUNICIPAL ENGINEERING, vol. xxxviii, p. 133; vol. xxv, p. 342, and vol. xxxii, p. 327. Rails less than 7 inches deep are not stiff enough for street work. A new method of track construction is described in vol. xxxii, p. 38, and vol. xxxiv, p. 40.

In vol. xxxiii, p. 425, is a brief description of El Paso, Tex., tracks using 9-inch, 90-pound, grooved rail. Other brief articles giving valuable information are, "Paving Street with Street Railway Tracks," vol. xxxii, p. 319; "T-Rails in Paved Streets," vol. xxxii, p. 320; "Street Railway Track in Macadam Streets," vol. xxxi, p. 282, stating the conclusions which lead to the selection of the T-rail for such work, and giving reference to earlier detailed articles, giving various points of view; "Form of Rail for Paved Streets," vol. xxx, p. 354.

Iron and Brick Paving Blocks for T-Rail Street Railway Construction.

I noticed in your publication some time ago an advertisement of a metal block, which was intended for the purpose of converting a T-rail into a grooved rail. This block was intended to serve the same purpose as the special brick made by the brick people for placing on the inside of T-rails and was somewhat of the same shape, although it was made of metal instead of clay or shale. If you would give me the address of the manufacturer of this metal block I would appreciate it very much.

H. L. S., Lynchburg, Va.

The only such block known to the writer is the Buckland paving block. It is described in MUNICIPAL ENGINEERING, vol. xxiii, p. 136, and is said to have been used in Springfield, Mass., Hartford, Conn., Norfolk, Va., Atlanta, Ga., and elsewhere. The name of the manufacturer is not given. Either this block was not successful or was not properly advertised, for nothing further has been heard of it.

A brick block for use with T-rails is described in vol. xxviii, p. 265. It was invented by W. H. Arthur, Stamford, Conn., and is sold by him and the Mack Manufacturing Company, Philadelphia, Pa. Other special forms of brick for such use are described in vol. x, p. 154, and vol. xxxii, p. 327, which can be made by any paving brick manufacturer.

Information About Calcium Chloride.

I find on page 392, November MUNICIPAL ENGINEERING a letter in regard to advantages of calcium chloride in highway construction. I should like to know where I can secure more information about this material and where it can be purchased in quantity.

G. E. S., New Haven, Conn.

Hubbard's "Dust Preventives and Road Binders" ($3) and Judson's "Road Preservation and Dust Prevention" ($1.50) give reports regarding the use of calcium chloride in reducing the dust nuisance. The former book gives the fuller treatment of the subject. Our correspondent, who is a new subscriber, is referred to the following articles on the use of calcium chloride in the last volume, xxxix, of MUNICIPAL ENGINEERING: "Calcium Chloride as a Dust Layer," p. 30, with references to previous articles on the subject; "Calcium Chloride and Its Action on Road Surfaces," p. 122, being a report of English practice and results; "Calcium Chloride for Dust-Laying and Road Maintaining Purposes," p. 214, being another letter from Mr. Howe; "Relative Action of Calcium Chloride and Oil on Stone and Gravel Roads," p. 292, the article referred to by our correspondent.

There are a number of manufacturers of calcium chloride. Those nearest our correspondent are Merrimac Chemical Co., Boston, Mass.; Eimer & Amend, 205 3d Ave., Roessler & Hasslacher Chemical Co., 100 William st., Wm. H. Scheel, 159 Maiden Lane, Chas. E. Sholes Co., 164 Front st., New York City; Solvay Process Co., Syracuse, N. Y.

Books on Bituminous Road Construction.

Can you tell me if there has yet been published any reliable work setting forth all the bituminous binders now recognized as good in road and street work?

Also, can I find any publication dealing with all the methods of reducing or eliminating dust by surface applications?

A. T., Jackson, Tenn.

New processes are presented to the trade so frequently that no book can keep up with them. The volumes of MUNICIPAL ENGINEERING are the freshest and most complete source of information.

Judson's "Road Preservation and Dust Prevention" ($1.50), gives brief descriptions of the character and use of each of the processes of dust control and prevention, under the classification of moisture, oil emulsions, oils, coal-tar preparations, with fuller descriptions of machines and of methods of construction of more permanent tar-macadam roads.

Hubbard's "Dust Preventives and Road Binders" ($3) is a larger book which goes into more detail, and is probably the book nearest what our correspondent desires.

Smith's "Dustless Roads and Tar-Macadam" ($3.50) is an English book devoted particularly to tar binders and tar spraying, and is the most complete book on this material, giving the excellent English practice. All these are reviewed in MUNICIPAL ENGINEERING, vol. xxxix, pp. 320 and 321.

As an example of what is presented in MUNICIPAL ENGINEERING the following titles of articles in vol. xxxix, just completed, are given: "Calcium Chloride as a Dust Layer," p. 30; "Books on Mac-

adam Country Roads," p. 34; "Specifications for the Bitu-Mass Pavement," p. 64 "Supplying Individual Demands for Asphaltoilene,' p. 67; "The Modern Problem of the Road, p. 109; "Cost of Asphalt and Bitulithic Pavements,' p. 113; "Calcium Chloride and Its Action on Road Surfaces," p. 122; "The International Good Roads Congress," p. 171; "Bituminous Roads, Mixed and Poured," p. 178; "Calcium Chloride for Dust-Laying and Road Maintaining Purposes," p. 214; "How to Lay Bitu-Mass," p. 242; "Work Preliminary to Road Construction and Street Pavement Maintenance," p. 270; "Tar Macadam Test Road," p. 295; "Bitulithic Pavement in Oklahoma," p. 332; "Bituminous Pavements, Patented and Otherwise," p. 358; "The Economics of Modern Highway Engineering," p. 374; "Relatives Action of Calcium Chloride and Oil on Stone and Gravel Roads," p. 392; "The Ohio Experiments on Road Binding Materials," p. 401; "A Pressure Road Oil Machine," p. 407; "A Portable Asphalt Plant," p. 410; "Road Surfaces to Suit the Traffic," p. 466; "Asphalt, Asphalt Macadam and Bitulithic Pavements," p. 475; "The Application of Oil to Highways," p. 490.

Oiling Highways.

I would like to see the subject of crude petroleum for highways discussed, methods, results, specifications.

B. S. R., ———, Okla.

Good discussions of this subject will be found in Judson's "Road Preservation and Dust Prevention" ($1.50) and Hubbard's "Dust Preventives and Road Binders," ($3).

The general conclusions reached are that the best results are obtained from crude petroleums having asphaltum base and that those having paraffine base are much less effective. Residual oils from the asphaltic oils are also used.

Mr. Hubbard says that specifications for oils or tars with which to treat roads must be made to suit the local requirements but suggests the following as a statement of what may well be required:

1.. The oil shall have a specific gravity not greater than 1.05 and not less than 0.98 at 25 deg. C., unless the residue obtained from the volatilization test (in clause 5) has a specific gravity of not less than 0.985.

2. It shall be soluble in -. p. carbon bisulphide at air temperature to at least 99 per cent. and shall contain not over 0.3 per cent. organic matter insoluble.

3. It shall contain not less than 12 per cent. nor more than 25 per cent. of bitumen insoluble in 86 deg. B., paraffin naphtha at air temperature.

4. When tested for 5 seconds at 25 deg. C, with a standard No. 2 needle weighted with 100 grains, it shall show a penetration of not less than 15.0 mm., nor greater than 25.0 mm., unless the residue obtained from the volatilization test (in clause 5) shows a penetration of not over 20.0 mm. when tested in the manner above described.

5. When 20 grams of the material is heated for 5 hours in a cylindrical tin dish approximately 2½ inches in diameter by 1 inch high at a constant temperature of 13 deg. C., the loss in weight by volatilization shall not exceed 20 per cent. The residue remaining shall show a penetration of not less than 10.0 mm., nor greater than 20.0 mm. when tested in the manner hereinbefore described.

6. Its fixed carbon shall not be less than 6 per cent. nor greater than 20 per cent.

7. The oil shall be free from water upon delivery.

These specifications eliminate some materials which it may be desirable to allow in some cases. In such cases the specifications may be modified, so as, for example, to admit preparations of Trinidad asphalt, tar products, or solid native bitumens. The true paraffin materials are eliminated and the oil will not be too hard under service conditions nor too volatile.

Specifications for applying oils to roads depend upon the material of which the road is made, whether earth, gravel or macadam, loose or compacted, and upon whether the oil is to be used by the penetration method to lay the dust and keep it down, or is to be mixed with the road material as it is laid and compacted, the oil thus becoming more or less a binder for the road materials as well as controlling the dust.

Information from various standpoints will be found in the following articles in MUNICIPAL ENGINEERING: In vol. xxxix: "Relative Action of Calcium Chloride and Oil on Stone and Gravel Roads," p. 392; "The Ohio Experiments on Road Binding Materials," p. 401, not including oil; "Road Surfaces to Suit the Traffic," p. 406. In vol. xxxviii: "Comparative Road Tests at Cornell University," p. 92. In vol. xxxvii: "Materials for Tarring Macadam Roads," p. 18; "Methods of Examination of Bituminous Materials for Use on Roads and Streets," p. 20; "Some Consideration of the Necessary Changes in Construction to Adapt Macadam Roads for the New Traffic," p. 109; "The Cost of Adapting Macadam Roads to Automobile Traffic," p. 143; "Dust Abatement by Surface Applications," p. 236, gives clear descriptions of methods of application of materials, which may be used as the basis for specifications covering the workmanship; "Specifications for Bituminous Macadam Pavements," p. 254, gives general terms of specifications and references to many specific sources of information and details of specifications, as well as references to previous articles in MUNICIPAL ENGINEERING; "Tar in the Surface Treatment of Roads," p. 297, also treats of the use of oil to some extent; "Three Years of Experience with Oiling Roads," p. 381. These may be used, when conditions are compared with those of the locality, to aid in the preparation of specifications. Other articles on the sub-

ject will appear from time to time in future numbers, on all the surface treatments of roads for dust abatement.

Street and Sewer Designs for New City.

1. With regard to our streets I may say they have never been properly made at all, but consist of loose gravel dumped on top of the black loam soil. They will have to be plowed up to a certain depth.

My idea is that for a 66-foot street the construction might be as follows: 8.5 ft. sidewalk on each side, 3-ft. boulevard on each side, to have easy access to drain laid under it at any time, 1.5 ft. for surface water drainage on each side, 40 ft. for actual road. What do you think of this plan? In rocking the road what sizes would you have for the crushed rock? If there are three layers, what proportion of each size should be used, and what rise should be made?

2. I should be glad to have your opinion upon combined surface water and sewerage system. Can this be carried out in perfect safety? Would it be a practical idea to have drain as in the road description above where any gases in the sewage drain would be sealed by traps in the connections by which the surface drainage reaches the drains?

G. W. N., Chilliwack, B. C.

1. The layout suggested is apparently for a residence street. In such case the sidewalk is wider than is necessary and so is the street. A width of 5 or 6 feet for sidewalk is generally considered sufficient under such circumstances, and there is no necessity for a street wider than 27 to 30 feet, including surface drainage gutter. This would leave 12 to 15 feet for each lawn or "boulevard," as it is termed by our correspondent. Except for ease in turning vehicles at any place, the width of the roadway may be made materially less than 27 feet. The drains, if intended to carry drainage water only, may be laid under the lawns as described, but trees will undoubtedly be planted in the lawns, and their roots will give trouble by finding their way through the joints into the inside of the drains, and it will be desirable to put the drains as far from the trees and as near the gutter as possible. If the gutter is not paved the drain might even be directly under it. Specifications for the road construction should be fitted to the local circumstances, physical and financial. Roads vary from 4 to 16 inches in thickness, according to the amount and weight of traffic, 6 to 8 inches being common for ordinary light traffic on residence streets. Sizes of stone vary also according to traffic and thickness of layer and quality of stone from 2 to 4 inches for the lower layers, and ½ to 2 inches for top layer, not including the binding material used, which is made up of smaller sizes and dust. The thickness of each layer should be at least equal to the largest dimension of the stone used, and two or three layers are used according to the size of stone used, the total thickness of the macadam, and the character of the construction for the traffic to be carried. These suggestions are as definite as should be given without full knowledge of the local conditions. The amount of crown or "rise" varies according to the width of road, amount of traffic, promptness with which repairs are made, longitudinal slope, etc. The extreme limits are about 1 in 12 and 1 in 30. That is, in a road 30 feet wide the center would be 6 to 15 inches higher than the sides of the road. Probably 7 to 9 inches would be considered most common in a residence street. Among many articles in MUNICIPAL ENGINEERING of direct application, reference may be made to one in vol. xxxviii, p. 306, for interesting information on cross section of highway.

2. The choice of the separate or the combined system of sewerage and drainage is one which could be made only after a careful study of the local conditions. Both are in successful use. The writer has used both systems, selecting the one to be used, first, from sanitary conditions, and second, from considerations of economy. No two cities are alike in this regard, and what is right for one may be quite the reverse for another. The question has been discussed at some length in several articles in MUNICIPAL ENGINEERING, some of which are the following: "Exposed Sewers at Leavenworth, Kan.," vol. xxxix, p. 347; "Sewerage and Drainage of Clinton, Iowa," vol. xxxvi, pp. 163, 220, 300; "Ordinance Controlling Tree Location and Roots in Sewers," vol. xxxvi, p. 236, giving references to earlier articles on the same subject; "Problems in Street Paving and Drainage," vol. xxxv, p. 105; "Tight Joints in Pipe Sewers," vol. xxxv, p. 356; "Roots in Sewer Pipe," vol. xxxiv, p. 239; "Notes on Sewer Design," vol. xxx, p. 329; "Rainfall and Runoff in Sewer Design," vol. xxix, p. 161; "Sewerage and Sewage Disposal at Bedford, Ind.," vol. xxvi, p. 109; "Best Plan for Sewerage for Small City," vol. xxiv, p. 276; "The Separate System of Sewers of Brantford, Can.," vol. xxii, p. 70; "Sewer Systems for Small Cities," vol. xxii, p. 303; "Sewer Systems of Small Cities," vol. xxi, p. 25; "Comparative Merits of Separate and Combined Systems of Sewerage," vol. xviii, p. 170; "Merits of Combined and Separate Systems of Sewerage," vol. xv, p. 306.

Literature from the Cement Industry.

Can you give me the names of any manufacturers of cement who publish literature containing illustrations of the cement industry? The information will be greatly appreciated.

MARY J. BOOTH,
Librarian, State Normal School,
Charleston, Ill.

The Atlas Portland Cement Co., Dept. N., 30 Broad street, New York, publishes the most elaborate books of this kind. The Indianapolis, Ind., office of the Le-

high Portland Cement Co., F. E. Paulson, general sales agent, publishes a monthly leaflet largely devoted to pictures of work in which their cement has been used. The Universal Portland Cement Co., Chicago, Ill., publishes a similar monthly "Farm Cement News." There are others. Letters to the cement manufacturers listed in the "Business Directory" published in each number of MUNICIPAL ENGINEERING under the heading "Cement," will bring their catalogs and other literature of the nature desired.

Another Dealer in Crushed Granite.

In the Question Department of MUNICIPAL ENGINEERING, vol. xxxix, p. 35, we note your answer to same, giving names of different companies in the north and south, but you did not mention us. We are in a position to furnish red granite, crushed granite and crushed quartz.

ST. LOUIS CRUSHED QUARTZ CO.,
Roe Building, St. Louis, Mo.

Lime in Portland Cement Mortar.

Can you tell me the effect of mixing lime with Portland cement for concrete and for mortar? I have read that one neutralizes the other, and that such a mixture is weaker than if either the lime or cement had been left out.

R. H. P., Kelowna, B. C.

If the lime is dry and hydrated it can be mixed with the Portland cement without injury. In fact, the lime acts to make waterproof the mortar and the concrete made with the mortar, if the right proportions of ingredients are used, because the fine lime powder closes the voids in the materials, thus preventing the passage of moisture. By the same filling of the voids in the mortar, even up to 15 or 20 per cent admixture of hydrated lime, seems to increase the tensile strength of the mortar. In general, therefore, it may be said that the use of the right proportion of hydrated lime in Portland cement is advantageous.

This subject is discussed in MUNICIPAL ENGINEERING in the following articles: In vol. xxxix: "The Effect of Waterproofing Compounds on the Permeability and Tensile Strength of Concrete," p. 225; "Hydrated Lime, p. 94. In vol. xxxviii: "Hydrated Lime Makes Concrete Waterproof," p. 129. In vol. xxxiii, "Hydrated Lime in Concrete," p. 342, showing the good results of using it and giving references to a number of earlier articles giving details on the same subject.

Such books as Sabin's "Cement and Concrete" ($5) and Taylor & Thompson's "Concrete, Plain and Reinforced" ($5), give results of tests and experience, practically all of which are favorable to the proper use of hydrated lime in Portland cement mortar.

Concrete Silos.

As a reader of your magazine I would like some information in regard to cement silos, either of concrete or cement blocks, and both.

First, I would like to know if either gives satisfaction as to keeping of the silage, and which is the best and cheapest.

Second, some kind of specifications and prices for both; also names and addresses of parties having built or had them built.

Third, whether or not it is better to, or not to, have a continuous door from the bottom to top.

Fourth, parties' names that make molds for blocks, or forms for silos, and any thing of interest in this line.

J. D. B., Cedar Rapids, Iowa.

The increasing number of concrete silos is evidence that they are satisfactory for keeping ensilage. The only complaints known to the writer are that if the inside of the wall is rough the ensilage will settle unevenly, on account of uneven friction on the walls, and the ensilage about the small air spaces thus formed will become moldy and must be thrown away. There is a similar effect if the inner surface of the wall is porous, for it will then absorb moisture from the adjacent ensilage, causing "dry firing" to a certain extent. The walls should also be air-tight to prevent excessive fermentation. It is claimed that well constructed concrete silos are better in all these respects than those built of any other material. There does not seem to be any material difference between the various methods of building silos, as regards satisfactory keeping of the ensilage, provided the construction is the best of its kind. This may be modified in cold climates by the desirability of the hollow wall, monolithic or block construction, to prevent freezing during the severe winter weather. The question of cost seems to depend upon local conditions, neither form being the cheapest everywhere.

2. Probably the most complete specifications, or rather descriptions of methods, will be found in a booklet "The Modern Farmer," published at the Indianapolis, Ind., office of the Lehigh Portland Cement Co. Other specifications will be found in the Atlas Portland Cement Co.'s booklet on "Concrete Construction About the Home and On the Farm." These specifications are also printed in MUNICIPAL ENGINEERING, vol. xxxv, p. 103. The Universal Portland Cement Co., Chicago, publishes "The Farm Cement News," which also considers the subject. The following addresses of those having concrete silos are taken from these various sources: U. S. Soldiers' Home, Washington, D. C.; Gedney Farms, White Plains, N. Y.; Blue Label Cheese Co., Winslow, Ill.; F. J. Bosler, Georgia, Ind.; Wilrus Stock Farm, Wausau, Wis.; A. O. Fox, Oregon, Wis.

3. Provided the door planks are so constructed as to be water and air tight

and the steel reinforcement is properly carried across the opening, the continuous door may be used. Some excellent silos use the continuous door with an exterior chute built around it and into the silo wall each side. The structure would seem to be somewhat more stable when empty if the openings are in sections and not all run into one continuous opening.

4. Any of the standard cement block machines may be used for making the blocks, provided, first, that the circular arc required for the size of silo to be built can be supplied in the forms, that the blocks can be made of sufficiently wet mixture to insure that they are water tight and practically air tight. The specifications referred to describe method of making and handling forms for the monolithic and hollow monolithic concrete walls.

For names of makers of molds, machines and forms for block and concrete, reference may be made to the "Business Directory" published in each number of MUNICIPAL ENGINEERING under the headings "Chimneys," "Concrete Blocks," "Concrete Block Machines," "Concrete Chimneys."

Real Estate Registry.

Will you kindly give me information concerning kind of records to be kept for real estate registry. We are about to establish a real estate registry, and would like to have the best system that can be had for a city of 12,000.

J. M. S., ———, Pa.

Will our readers favor this correspondent with their suggestions?

In some Indiana counties maps are made by order of the county commissioners at intervals of several years upon which the real estate transactions are entered from the county recorder's books, and these maps are the basis of the work of the township and county assesnors. They are on a large scale, and changes in ownership and descriptions of property are entered upon them until they pass the readable stage, when a new and revised copy is made. This may possibly answer the purposes of our correspondent as a real estate registry.

Commission and Other Forms of City Government.

I am a reader of MUNICIPAL ENGINEERING and would like to have some information on the commission and recall form of government for cities.

Could you advise me as to the objections being made to the new form and in what way the ward system is preferable to the new form, and vice versa? I would greatly appreciate any information on this subject, or reference to any authority on this subject.

E. H. S., Ottawa, Kan.

There is much misconception of what constitutes the commision form of government and the arguments for and against it are many of them misapplied on that account. Non-partisan nominations, elections at large and not by districts, initiative and referendum, the recall, are all ideas which were developed and applied long before the commission form of government, so-called, was instituted and they are applicable to most if not all, other forms of city and state government. They have been applied, some of them, to the so-called federal form of government in the new Boston charter, a form which is not truly federal, but is a business-like organization having some resemblances to the federal form, but really based on another principle. The Galveston plan has come to be called the commission plan, and was successful under the peculiar conditions there existing, and it differs from others in electing five persons to be equally responsible or irresponsible, in the municipal government. It is a reversion to the old council form of government, which has long been discredited in this country, though far more successful in England, whose municipal voters are in this respect more democratic and more interested in good government for themselves. But it lacks the salutary veto power of the mayor. Besides the circumstances of the case, the adoption of the non-partisan nomination of candidates and the selection of candidates for merit account for the early success of the plan.

No other city has adopted the Galveston plan entirely. Each city or state adopting the plan has made its addition of safeguards, which are the really valuable features of their plans. They succeed in spite of the strictly commission feature.

The city of Indianapolis, the originator of the Indianapolis plan, misnamed the federal plan, is now discussing the commission plan, but has not yet separated the commission feature from the other features named, and is floundering in the fog of misunderstanding and misconception of the two plans, and does not yet see that the good features of the plan they are calling the commission plan, can be applied equally well to the Indianapolis plan, thus improving that plan and escaping the dangers existing in the one feature which is, strictly speaking, the only feature properly bearing the name "commission plan."

Articles elsewhere in this number of MUNICIPAL ENGINEERING give further details regarding the discussion.

On p. 36 of vol. xxxix, is an article on charter for small city, which refers also to one in vol. xxxviii on the commission form in Memphis, really the first city in the country to use the form; one in vol. xxxviii, p. 345, compares the commission and federal forms; one in vol. xxxviii, p. 404, describes the Indianap-

olis form, etc. There is a brief outline of the Illinois law in vol. xxxix, p. 219. In earlier volumes are more or less extended descriptions of the forms in use in Galveston, Des Moines, and elsewhere.

Influence of Indeterminate Franchises on Sales of Bonds of Public Service Corporations.

Will you kindly send me such data and information as you have at your command in regard to the sale of bonds of public utility corporations operating under long-term franchises, as compared to the sale of bonds of corporations operating under indeterminate franchises? Our local public utility corporations have made the argument that if their franchise was made an indeterminate one, that they could not extend their lines because they could not dispose of the bonds readily. They wish to have their franchise extended from twenty-five to fifty years. This proposition will be submitted to the voters of this city in the form of a charter amenment. We wish to offer an alternative proposition along the lines of granting an indeterminate franchise. In order to be perfectly fair to all, we wish to have as much information upon the subject as we can obtain.

Your kindness in this matter will be greatly appreciated.

PERCIVAL E. WOODS,
Supt. Dept. of Finance, Ways and Means, San Diego, Cal.

It will be impossible to answer this question definitely. Legislation and court decisions have been so generally opposed to long-term franchises that the arguments against fifty-year franchises have crystallized very definitely, and the effect of reducing the length of franchises to twenty-five years or thereabouts, has been so discounted that, especially in states where these shorter terms are the only ones available, the bond market for the securities of public service corporations is reasonably steady, and apparently not much more difficult than that for the longer franchise terms. Indeed, twenty-five to thirty years is now generally accepted in most parts of the United States as a reasonable limit for franchises granted by municipalities.

Of late years there has been a strong tendency to scrutinize the securities of public service corporations much more closely than in the past. This has come about because of the criminally careless management of some, the equally criminal manipulation of others, and the real instability, as shown by experience, of long-term franchises if they are not equitable, or have been outgrown by the city granting them or the companies operating under them. The shortening of the franchise term is even considered an advantage by some investors, as it has a tendency to keep the feet of the managers a little nearer to solid earth.

This demand of stockholders for more efficient service by the managers of their companies is met, without trouble or expense to them, by the supervision of the companies by state commissioners. The Wisconsin law proceeds frankly on the principle that this supervision is as advantageous to the companies as it is to the cities interested, and offers the benefits of the law to all companies who will give up their term franchises, long or short, and accept the regulation of the state commission, and franchises of indefinite length, i. e., continuing during good behavior. The commission has demonstrated the propriety of this assumption and most of the public service corporations have acknowledged its validity by accepting the indeterminate franchises and state regulation. There is no pronounced complaint of objectionable effect upon bond sales. Indeed, the far greater safety of investments in companies so supervised is coming into recognition and the securities of public service corporations are rapidly assuming the stability of other high-class investments and the rates of interest demanded are reducing as a consequence.

In a state without a public service commission the supervisory feature is not available, but it is possible so to hedge issue of securities, ill-considered actions of council, and other matters of controversy and of danger to investors, that very nearly the same result is secured. This may be done, for example, in the manner described in the articles in MUNICIPAL ENGINEERING referred to in the article in this department on "Specifications for Electric Lighting Contract."

A very valuable discussion of this subject, with references to actual practice, is given under the heading "Rate of Return for Interest and Profits" in the decision of the Railroad Commission of Wisconsin in the case of the State Journal Printing Co., et al., vs. Madison Gas and Electric Co., made March 8, 1910, and probably obtainable from the commission at Madison, Wis.

List of Water Works Superintendents.

Where can a list of water works superintendents in the United States be secured, and how much will it cost?

E. M., Chicago, Ill.

The writer knows of no comprehensive lists of names of water works superintendents issued since the last edition of the "Manual of American Water Works ($1.50) of 1897, and the "Municipal Year Book" ($1.50) of 1902. A list of names of water companies, municipal and private, in cities of 10,000 or more, will be found in the "Engineering Directory" for 1910, published by *Domestic Engineering*, Chicago. ($5.)

Books on Bridge and Building Foundations.

Kindly advise me of the best book issued dealing with ordinary bridge and building foundations.

A. J. S., Winnipeg, Man.

Probably the best book for our correspondent's purpose is Fowler's "Ordi-

nary Foundations" ($3.50), Freitag's "Architectural Engineering" ($3.50) has a good chapter of nearly 90 pages on foundations for buildings; Ketchum's "Design of Highway Bridges" ($4) has a chapter on the design of abutments and piers, which devotes some space to their foundations.

Patton's "Foundations" ($5.00) is a practical treatise covering the ground quite fully. Cooper's "General Specifications for Foundations and Substructures of Highway and Electric Railway Bridges" ($1) is prepared by an expert. So is Corthell's "Allowable Pressure on Deep Foundations" ($1.25).

There are good chapters on foundations in such hand-books as "Kidder's "Architects' and Builders' Pocket Book" ($5), and there are more or less extended chapters in general books on civil engineering, bridge design, etc.

The construction of concrete foundations is described in such books as the "Handbook for Cement Users" ($3), Buel & Hill's "Reinforced Concrete" ($5), and Taylor & Thompson's "Concrete, Plain and Reinforced" ($5).

A New York city foundation is described in MUNICIPAL ENGINEERING, vol. xxxii, p. 150.

Disposal of Brewery Waste.

Where can I obtain Naylor's "Trades Wastes," referred to in the October number of MUNICIPAL ENGINEERING, or anything else on the subject of the treatment of brewery waste

J. S. R., Monongahela, Pa.

Naylor's "Trades Wastes" ($6.50) can be supplied by the business department of MUNICIPAL ENGINEERING on receipt of price. The American trade is supplied by J. B. Lippincott Co., Philadelphia, Pa.

There is not much which is definitely satisfactory as yet regarding the disposal of brewery waste, which is still the subject of experiment.

The city of Reading, Pa., has made a careful study of the various trades waste and divided them into three classes: Wastes which may be discharged directly into the canal or river; wastes which can not be discharged into the canal or river or allowed in the city's sanitary sewers without purification; and wastes which can not be discharged into the canal or river directly, but may be discharged into the city sanitary sewers. It classes brewery wastes in the third of the above classes.

A paper by Mr. Wm. Naylor, author of the book on "Trades Wastes," above referred to, states that brewery wastes are received into the sewers without giving rise to abnormal developments at Blackburn, England, but at Shepton Mallet, with much greater ratio of waste to sewage, the consequences are disadvantageous. Strong brewery waste may become sour, and in such case it impairs the usefulness of the sewage filter; but the introduction of competitive and more active organisms, such as the anaerobic bacteria of putrid sewage has the effect of preventing the souring almost completely of liquors containing starch or starch products. This is the reason for the process which he recommends in his book for the treatment of brewery wastes which are strong enough to affect deleteriously the purification of the sewage. Brewery waste can be treated with difficulty, if at all, in bacterial filters, owing to the formation of acids, unless it has a mixture of sewage.

At the Hook Norton Brewery Company's brewery, Hook Norton, Banbury, England, a settling tank and continuous flow sand and gravel filter was used, but with little success, during the six years, ending 1898. It was then tried intermittently with no better result, and on the suggestion of the author the plant was remodeled in 1900. The flow is reduced, by eliminating all clear water, to about 12,000 imperial gallons of strong liquor per day. This is impounded in a settling tank for not less than 24 hours in contact with putrid sludge from sewage, or 5 per cent. of domestic sewage is admitted to the tank, and when the putridity has once been established, sewage-sludge is no longer necessary. The contents of this tank, which may be termed an "anti-souring" rather than a septic tank, and pumped continually by a pulsometer delivering into the hopper of the sprinkler over the filter. After two years' use the filter was in better condition than when it was started.

The filtering medium is coal, screened and graduated in size from about 1-inch cubes at the bottom to ¼-inch cubes at the top. The company, being well provided with steam, were prepared (under threat of legal proceedings from two sources) to pump the first filtrate on to a second filter for further purification, but this was not found necessary. The little suspended matter present after the first filtration is intercepted by shallow sand filters, and the effluent is clear, neutral, colorless, sweet, contains nitrates, and liberates albuminoid ammonia to the extent of about 0.1 part per 100,000. The diminution of dissolved oxygen after saturation is less than 30 per cent.

Large Fire Fighting Machine for Billings, Montana.

Billings has recently purchased and installed one of the largest fire-fighting machines ever built. It is a triple combination automobile, weighing in excess of five tons and capable of attaining a speed of forty miles per hour. The apparatus was manufactured by the Robinson Fire Apparatus Manufacturing Company, of St. Louis.

FROM WORKERS IN THE FIELD

Practical Points from Practical People.

Contributions to this Department are invited. Give from your experience for the benefit of others. No matter about the style of the composition, the fact is what is wanted. Use the Question Department for what you want to know; use this Department for what you can tell others.

Construction Difficulties in Nebraska.

To the Editor of MUNICIPAL ENGINEERING:

Sir—The job, construction of a small power plant on a stream flowing sixty to eighty second-feet, is not of sufficient importance to merit mention, but some things were done that I have never seen described and which may be of interest. The water wheel was placed in the concrete part of the dam, which also served as foundation for the wooden superstructure. It was in the sand hill district of northwest Nebraska. These hills are composed of a fine white silicious sand, free from vegetable matter. When dry, the sand drifts before the wind like frozen snow, and when sufficient water is present it behaves, in most respects, like quicksand.

The present stream is fed entirely by springs. Its bed is of quicksand, interspersed with sand and gravel washed by rains from the adjacent uplands, and at some period antedating the sand hills a river had strewn a mantle of Rocky Mountain gravel over the plain. At all points in the valley corresponding with the level of the stream, water and quicksand are encountered, making foundation work "wet work," and making it useless to cut a channel for the stream around the site during construction.

The site was located where the stream was underlaid with a stratum of soft magnesian sand stone (solidified quicksand). Good concreting sand was to be had in the bluff about a mile distant, but gravel, free from adhering quicksand and magnesian mud, was not to be found. So the gravel was taken from the channel at the lower site.

To separate the sand and gravel we constructed a sort of dredge, consisting of a bottomless chute 14 feet long, 4 feet wide at the discharge end and 8 feet at the up-stream end, where panels were fastened at an angle and of sufficient length to confine the flow of the stream and cause a strong current through the chute. This washed the quicksand from the heavier gravel, moving from twenty to fifty yards of sand to uncover a yard of gravel. In this way deep holes were dug, with the gravel piled up below and the quicksand washed on downstream.

The attempt to make the dredge move forward automatically did not prove a success. This dredging was continued on downstream below the magnesian bottom and served to materially lower the water at the site. As soon as a continuous surface of gravel was presented, erosion stopped. We first, with rakes, gathered the film of gravel into piles, exposing a new surface on which the water could act. But as soon as the gravel was piled from the swift current it was again buried in quicksand. So we devised a cradle 18 inches wide and 2 feet long, with 2x6 sides and screen on the bottom and one end, cross-slats being added to give sufficient strength. About one-third of the way from the closed end legs extending downward about 6 inches were securely nailed. This cradle was held in the current with the open end upstream and the gravel was raked in. The man in charge of this work soon found a large grain scoop with a long handle was the thing to use. Holding the cradle in place with his shins, the long handle over his shoulder, and grasping it above the blade, he was able, aided by the force of the water, to fill the cradle at a single stroke. Then, following a few rockings of the cradle, balanced on its legs, to remove the remaining sand, the clean washed gravel was deposited in the wagon by lifting the "cradle." By this method gravel cost about $1.20 per yard. In this water screening a smaller screen can be used than in dry work.

Following the removal of most of the gravel, as described above, there still remained 2 to 3 feet of material to be cleaned off before the rock bottom was exposed. The surface of this rock was so rough that it was impossible to clean with the scraper, so the rock was washed clean.

Cement sacks were filled with gravel and laid in the channel so as to force the water into a narrow swift current. By starting this current at one side of the channel, and, as it cleaned to the bottom, rearranging the sacks so it would cut laterally back and forth across the stream, it was an easy matter to remove large gravel from holes 2 to 3 feet deep, and to cut away all of the softer surface rock and lay the harder rock entirely bare. As soon as a sufficient area was cleaned, the sacks were laid so as to inclose it, laying the sacks in a double row to the required height, separated about 6 inches, and tying each alternate

pair together with wire. This double row of sacks formed the inclosing walls of the coffer dam and the space was filled with the water-excluding material. As clay, loam, dirt or any of the commonly used water-excluding materials were not to be found in the vicinity, this filling did not appear to be a simple matter. We located what had apparently, at some time past, been a pond or slough where rushes had grown and fallen into partial decay, leaving a material much resembling peat or turf. This we used as packing, making a water-tight joint. Owing to accommodating the flow of the creek, the work was done in two parts. Instead of using sacks for the second coffer dam, we found a springy place where the sod grew rank and used the sod from here. A removal of from 4 to 8 inches of sod exposed pure sand. In many respects I prefer a coffer dam built of sod to one of sacks. Before the water-tight packing of the second coffer dam was completed our material was exhausted. So we resorted to the second breaming of sod. Chopping this fine and mixing it with magnesian muck, we succeeded in making a good anti-leak compound. For, with a double sod wall, three sods thick each, and a foot of packing between a 6-foot head of water was completely shut out. As with the sacks, it is necessary to tie the sod walls together.

H. A. MARK, Morrill, Neb.

Where Can the Specified Oil for Treating Wood Paving Blocks be Obtained?

To the Editor of MUNICIPAL ENGINEERING:

Sir—In your December number, under the caption "Where can oil fulfilling the standard wood block paving specifications be obtained?" is published a letter signed "M., New York," commenting on the report of the wood block paving specifications committee of the American Society of Municipal Improvements made to that society at their convention at Erie, Pa. This letter states that the writer wrote to several members of the committee, and then gives a partial copy of the letter sent.

This letter was received by my office on November 1st, but did not come into my hands until two weeks later, owing to absence from town. On receiving it an investigation was taken up to ascertain who would guarantee to furnish an oil complying with these specifications, and several parties were found willing to supply it provided their orders were sufficiently large.

After corresponding with the other members of the committee, however, we decided as a whole that it was hardly the place of the committee to hunt up oil refiners for wood block manufacturers so long as there did not appear to be any discrimination in the selling of this oil. We thereupon wrote an answer as follows:

"We might say, to start with, that the assertion in the report of the committee of the American Society of Municipal Improvements on the subject of wood block paving specifications that 'investigation on our part had shown that the oil recommended was not controlled by one company' was made in reference to wood block manufacturers only and did not relate to oil manufacturers. We would, of course, have answered you as regards the wood block manufacturers at an earlier date, but as you desired to know the names of manufacturers of oil in the country who could deliver such a material, we have delayed writing in hopes that we could ascertain the names of a few of such parties. While not as successful up to the present time in this as we had hoped to be, yet we have decided not to further delay in answering you.

"Our reason for believing that this oil is not controlled by one company is, first: the statement made in Bulletin No. 4 of the Bureau of Municipal Research in the paving report on wood paving block in Cincinnati, Ohio, page 8:

" 'Two kinds of coal tar oils are in common use for treating wood paving blocks—one, a coal tar creosote of a gravity approximately between 1.03 and 1.08 at 68 degrees F., with practically no free carbon; the other, generally produced as a mixture of this creosote with coal tar or pitch, the gravity being 1.10 or higher at 68 degrees F. and containing small percentage of free carbon up to 5 per cent.

" 'Both of these are commercially feasible—i. e., they are readily obtainable in large quantities, at prices from 6 to 8 cents per gallon.'

"Second: It is readily understood and appreciated by everyone acquainted with the tar industry that any coal tar can be filtered so as to produce a tar sufficiently free from carbon that when mixed with a proper creosote oil will produce a product such as called for in these specifications. The by-product coke oven tars produced in Nova Scotia are well adapted to the manufacture of such an oil.

"It is also reported by one of our inspectors that the Ayer-Lord Tie Company buy this oil from two different sources that are entirely independent of each other. One of these is the Barrett Manufacturing Company, and the other we have been unable to ascertain as yet.

"Our belief and assertions in this matter are entirely agreed with by Dr. Gellert Alleman, Professor of Chemistry, Swarthmore College. The following is a quotation from a letter which we have just received from him in this matter:

" 'I have no hesitation in stating that any dealer in tar can fulfill the specifications to which you refer by either filtering the tar and adding a certain proportion of creosote oil to it, or in some cases by adding creosote oil to the unfiltered tar. There are a number of coke oven tars now made in this country which con-

tain less than 8 per cent of free carbon, and, at the same time possess a gravity of about 1.15. Such tars, unfiltered, when reduced with creosote oil, will yield the material you require. There are two Philadelphia oil firms which could supply this material, but would be unwilling to do so unless the orders were quite large. I suggest that the F. J. Lewis Mfg. Co., Chicago, might also be in position to do likewise.'

"I know that Dr. Alleman will be only too pleased to put you in touch with manufacturers of this product. I have also been informed that you can procure this oil from the very same parties who are now furnishing you with the lighter creosote oil which you are now using. There is no evidence to prove that oil of the kind called for by these specifications is not being supplied to a very considerable number of wood block manufacturers and that there is any discrimination against any one manufacturer in the matter of price. For these reasons we do not believe it is the province of this committee to hunt up the names of oil manufacturers for contractors."

I beg to correct a statement in the editorial comments on the above communication in which is stated "The above sub-committee report was prepared by a single member of the committee after arrival at the convention and was presented as such." This is not correct, as a report was written several weeks before the meeting of the society and was discussed by two members of the committee before attending the convention at Erie. At the convention the committee had several meetings at which the preliminary report tentatively prepared by two members of the committee was revised at least three times.

A. W. Dow,
Chairman of Sub-committee on Wood Block Paving Specifications of A. S. M. I.

To the Editor of MUNICIPAL ENGINEERING:

Sir—I note in your issue of December, 1910, on page 474, a communication from M., New York, in regard to oil for filling the standard wood block specifications proposed by a sub-committee of the American Society for Municipal Improvements.

If you will put me in touch with him, I should be glad to show him that it would be impossible for any competitor of (a company named) to obtain oil of this kind in America, as the supply is practically controlled by that company.

CLIFFORD RICHARDSON,
Consulting Engineer, New York City.

The question raised by Mr. Covell about the specific gravity of creosote oil for the treatment of wood block pavements was very thoroughly discussed at a convention of municipal engineers held in Chicago about a year ago, for the purpose of standardiing paving specifications. The committee charged with the preparation of specifications for creosoted wood block pavements held a conference with representatives of some of the creosoting companies and listened to their side of the argument relative to the proper value of the specific gravity of this creosote oil. The question was given very careful consideration and this committee had the assistance and advice of some of the best chemists that could be obtained, and after a very careful review of the data, recommended a specific gravity for this creosote oil of 1.10.

During the past year this committee, of which the writer is a member, has been subjected to considerable criticism by certain companies and individuals on account of the limiting value of the specific gravity of the creosote oil adopted by this convention. Certain of the companies in this country engaged in the treatment of wood block for pavements alleged that creosote oil having a gravity of 1.10 could not be obtained except from one corporation, in other words, the product was controlled by one company.

The American Society of Municipal Improvements recently appointed a committee to prepare standard specifications for creosoted wood block pavements. As the time allowed this committee for the preparation of a report was so limited the committee decided to adopt tentatively the Chicago specifications with some slight modifications. This committee felt, in view of the recent criticism, that the matter of the value assigned to the specific gravity of the creosote oil should be investigated, with a view of determining whether or not the statements made by certain of the creosoting companies, to the effect that the product was controlled by one company, was true. Mr. A. W. Dow, of the firm of Dow & Smith, of New York, a member of the American Institute of Chemical Engineers, and chairman of this committee, reported, after making many searching inquiries, that creosote oil having a specific gravity of 1.10 could be obtained by any one having the necessary capital. As this part of the report was left in the hands of the chairman of the committee I personally did not inquire into the matter and endorsed the report of the committee. Today I received a letter from a company, asking me for information as to where they could obtain 200,000 gallons of creosote oil having a specific gravity of 1.10.

In view of the foregoing, it appears that the question relating to the proper value of the specific gravity of creosote oil for the treatment of wood block pavements is worthy of further consideration.

In my opinion, the quantity of preservative treatment for timber should be determined by the character of the wood to be treated and the uses for which it is intended. For example, in the case of wood block pavements the quantity of preservative used should be determined by the amount of traffic to which the pavement would be subjected, rather than by an arbitrary fixed amount. The wood block pavement subjected to heavy traf-

fic requires a less amount of preservative than a wood block pavement laid on a residence street or alley where the traffic is light and is used for only local needs. The treated block in the first instance will wear out before it will rot out, while in the latter case the wood will decay before it wears out, and therefore a larger percentage of preservative should be used in treating the wood.

With respect to the quantity of treatment for railroad ties and lumber used for structural purposes, it appears that a preservative treatment of ten to twelve pounds of oil per cubic foot prolongs the life of this material several years. Would it not be economy to use a larger percentage of preservative at a relatively small additional cost and thus prolong the life of the wood a few years more?

N. S. SPRAGUE,
Superintendent Bureau of Construction, Department of Public Works, Pittsburg, Pa., in the *Proceedings of the Engineers' Society of Western Pennsylvania.*

These communications and statements are printed as received during the past month except that such personal allusions as are not pertinent to the matter have been omitted. They are presented for the information of our readers without comment, other than a further request that the definite information suggested in Mr. Dow's letter and its enclosure as obtainable, be sent to us for publication with any other information which our readers may have on the subject.

Particular attention is called to Mr. Dow's correction of the editor's statement regarding the preparation of the committee's report with regret that misinformation or misunderstanding of information received should have caused the error referred to.

A Winter's Use for Stove Ash and Furnace Cinders.

To the Editor of MUNICIPAL ENGINEERING:

Sir—With the rapid development of fast-moving and heavily-laden vehicles has come a road problem that calls for a quick and practical solution.

In the evolution of heating and power plants that marks this early part of the twentieth century comes a troublesome waste in ash and cinders during the winter season. With this ash and cinder accumulation comes a period under present prevailing methods when practically all repair work on roads and pavements ceases. With this cessation of work bad, rutty conditions develop.

The ordinary hard and soft coal stove ash has not body enough in it to make a surface or wearing composition; but it will pack and make a bottom almost as firm as cement concrete if saturated with water. The top three or four inches, however, should be filled with a furnace cinder having a sufficient clinker in it to give it a body, binding and wearing substance. When depressions are shallow, as for instance in brick, block or asphalt pavements, the fine cinder may be used as a filler with very satisfactory results, and this filling is the proverbial "stitch in that that saves nine." To get satisfactory and staying results from the cinder and surface filler, it must be mixed with some substance that will cause it to pack and hold its place; yet one which will not become hard and brittle enough to crumble and break up. Calcium chloride furnishes such a flux or binder. The chemical and cinder are mixed about as a dry concrete batch is mixed, after which this combination is filled into the depressions of pavements or roadways in such quantity as to leave a slight crown after being tamped firmly into place. The traffic over it will then iron it down hard. This mixture will keep anywhere, an indefinite time, and will always be ready for use. If it is long exposed to a dry atmosphere so that the chemical has had a chance to dry out, it should be thoroughly saturated with water before being used. If used as a temporary patch, when permanent repairs are made, it may be gathered up and re-used as long as any of the combination lasts.

Calcium chloride is a chemical sponge in that it will absorb moisture and allow it to evaporate exactly like a sponge. If the elements have provided moisture enough for a thorough packing no wetting is needed. One should be sure that this moisture exists, for it depends upon that for a bond. It is not hard as with a cement bond, nor sticky as with oil or tar. It creates an elastic surface without any perceptible wear or disintegration.

This method makes a valuable use for ash and cinder wastes, and places are generally found for this use close to the point of accumulation. The combination also insures a smooth, even road surface at a trifling cost at all times. In fact the saving in wear on rutty pavements will make good the cost of application many times over, and the saving in wear and tear on vehicles will prove another very decided gain. There is the added advantage of a road which makes possible speed and comfort in riding at a season of the year when roads generally are rutty and dangerous.

On dirt roads a little co-operation is needed between the dweller on the road and the road maintaining officials. The people living on these roads should scatter their ashes during the winter months into the wheel ruts and low places. In the spring the road commissioner can go over them with a fine spike harrow or with a mixing and leveling drag, thoroughly mixing the dirt and ashes. This will give a firmer and better road body than will an excess of either dirt or ashes alone. If after the spring dressing people want to spend one to five dollars per lot for a chemical application and mixture, they will have a smooth and absolutely dustless roadway, a thing they

cannot get with any form of pavement except by frequent sweepings or flushings and too frequent applications of either of these cleansing methods is detrimental to any form of roadway.

I have had the fullest co-operation of the Hon. Jacob J. Haarer, Detroit commissioner of public works, in working out these experiments. Many of the industrial plants in and around the city have treated and are treating their roads and walks through and around their places, while nearly all of the cemeteries have maintained their roads by this chemical treatment for the past year or two, so that I am confident we are well past the experimental stage. Cities, towns and industrial institutions can now have ideal road conditions at a trifling cost, if indeed they do not get them at an actual saving. Again, this method of construction is the only form of roadway that will stand up under the rapidly moving or heavy traffic, as, from its semi-elastic nature, rapidly moving auto tires and heavily-laden truck wheels simply iron down the surface, instead of breaking and grinding it up to later blow away. Here the road has no destructive tendencies. It is one that calls for no limitations on traffic and one that costs much less to make and maintain than any that has yet come into the field.

S. G. Howe, Detroit, Mich.

An Argument for Pitch Filler for Brick Pavements.

To the Editor of MUNICIPAL ENGINEERING:

Sir—The following letter to the National Paving Brick Association was written with the sole idea of inducing the associatiol to change their specifications for the betterment of brick paved streets, believing as I do that brick is the only logical and economical pavement, and that streets paved with this material should last at least fifteen to twenty years under heavy traffic, and that no other known material, except stone, that has yet been tried, has lasted over ten years. Brick is the only material that can be readily repaired, and without the use of an auxiliary plant. If, in your judgment, the following letter contains anything that may be of benefit for the betterment of streets and you care to publish it, I shall be pleased to have you do so:

We received your letter dated November 21, in which you state that you are trying in many directions to persuade the use of paving brick on the streets and highways of this country, and that you are trying your best to teach the proper use and manner of laying them. In connection with the above statement, we beg leave to offer a few suggestions that occurred to the writer in connection with the laying of paving brick. I am not of that class of people who think they know it all, and I only offer the following suggestions as viewed from my own standpoint, and an experience in street paving extending over a period of the last forty years.

I was associated with the company that laid the first paving brick in the city of Detroit on Jefferson avenue and Griswold street, paved, I think, twenty-two or twenty-three years ago with Canton and Bucyrus brick. The bricks were of the ordinary stock size, without lugs, and the intersections were filled with pitch. The majority of the brick then laid are still on Griswold street, and are in passable condition.

The first brick used in Detroit for paving was a small brick. Where I have examined the brick paving in different cities throughout the United States, I find that this size brick has worn very much better, and with a more even surface than the larger brick. For myself, if I were to make my own bricks to pave my own street, I would make a brick running about fifty to the square yard, with a square edge, so that when laid, the brick would lie close together. It is impossible, under our present system of burning, to get an even vitrification on the brick. If a brick is so burned that the center is thoroughly vitrified, the outside will be over-burned. I venture to say that seventy-five per cent. of all paving brick used are burned too hard. A brick should be tough, but not brittle.

For the first twelve or fourteen years, and after the introduction of the large block, and before the introduction of the lug brick, pitch was used exclusively as a filler, and the majority of all the streets paved during all that time were in fairly good condition for many years, and some of them are in good shape today.

The specifications of our city, and nearly all the other cities in the country, were then changed by the association to the cement filler, composed of three parts sand and one part cement; and with lugs introduced about the same time. Pavements laid with these specifications lasted fairly well, although many of the bricks showed chipped edges and surfaces, and a decided tendency of the pavement to expand and crowd the curbing out of line, in many instances forcing the curb stone back from one to two inches on each side of the street. Then, the association saw fit to increase the proportion of cement used in the filler, and make the parts two of sand and one of cement. The result of this increase of the cement, caused a decided change, inasmuch as the bricks began to show signs of crystallizing and shelling off at the tops and with the thermometer above 78 the pavement lifted from its bed, and caused the rumbling noise now so much complained of. Pavements laid in this city soon show a decided breaking up and rough surfaces, and an appearance of having been laid for eight or ten years.

The necessity also arose for a space for expansion on the above streets of the city, next the curb, and also expansion joints laid transversely across the street every twenty-five or thirty feet.

Not content with this formula, the association then recommended, and I understand that your Mr. Blair, in his recent looking-up of our pavements in this city, also recommended a filler composed of one part sand and one part cement. This formula was adopted about three years ago in Detroit, with the following results:

Where a street was laid with a considerable crown, during the summer months the paving has lifted from its bed, and a displacement has taken place, so that when the street finally settles,

it shows a rough and uneven surface; also, and in every instance has shown cracks parallel to the curbing all over the surface of the streets. To such an extent has this taken place here, that many of the people are seriously considering the discontinuance of brick as a factor in our paving. And now, what are the practical reasons and causes for the above showing?

It shows that you have been working along theoretical lines, instead of studying the practical conditions and results following the above methods.

In the first place, the engineers, as a rule, are not practical pavers, and with all due respect to the brick manufacturers, very few, if any, of them understand the paving proposition.

In the first place, there is very little, if any, expansion in vitrified brick, and if there be any expansion, it is within itself; and instead of expanding outwardly, it expands inwardly, closing in upon the voids; while cement, more susceptible to heat, is responsible for ninety per cent. of all the expansion that takes place in a brick pavement. Where your specification was three to one and there being absolutely no expansion in sand), there still was some room for movement. As you increased the proportion of cement you added to the expansion properties, and consequently in a one-to-one mixture the expansion is so great that it is impossible to take care of it in any known manner.

With the introduction of the lug, you left the edges of your brick farther apart, thus giving a greater chance for cleavage; whereas without lugs, the bricks were laid close together and overcame this objection. The bricks are often found broken in half in the pavement, caused by uneven pressure.

Now, I beg leave to submit that the above statements and facts borne out by the actual results here in this city, and in my humble opinion, the lugs are an injury to the pavement, although a temporary benefit by saving material to the manufacturers. I maintain that the life of the pavement would be increased twenty-five per cent. by leaving them off; but the point that I want to emphasize most is the filler.

By the use of pitch any good brick will not show wear to any great extent for a period of eight to ten years, under heavy traffic. Pitch is the only filler that will penetrate and fill all the interstices in brick. Take for instance, brick with lugs, the pavers will lay at least ten per cent. of the brick with the two flat sides together. In taking up the pavement, you find that the cement has not filled one-half of the spaces, therefore causing an uneven strain, and a breakage where the two lug faces come together.

Now, I am aware that the contractors are opposed to any other filler than cement on account of the tedious methods we have to use with a pitch filler. I am also aware that theoretically I may be in error, but practically I know I am right.

Just one more argument in favor of pitch filler:

It has been shown conclusively that wherever street flushers are used for the cleaning of the streets, the cement filler is being greatly worn away. I have just inspected a piece of pavement laid two years ago, on which the flusher is used, and the cement is at least three-fourths to an inch below the surface of the brick.

Now pitch will withstand all this; it makes a thoroughly waterproof pavement; prevents absorption; prevents frost, one of the greatest enemies of brick; prevents granulation, rotting, etc.; gives room for all expansion; lessens the noise fifty per cent., and takes away all disagreeable, rumbling sound.

This company is not interested in any pitch company, but we are in the brick business to stay, and we prefer any filler than cement. Dry fine sand would suit us.

Wherever the word "pitch" is used, I also include asphalt fillers.

Anything we can do to further the brick industry we shall be pleased to join with you.

DETROIT VITRIFIED BRICK CO.,
By R. M. Adams, Gen'l Agt.

The above letter is published because MUNICIPAL ENGINEERING desires to present all sides of matters which are under discussion, although it does not agree with all the statements made in the letter. Some of these statements make it evident that the brick pavements in Detroit, at least those referred to, have not been well laid, and this fact gives the reason why pavements mentioned in the letter are only in "passable condition," bricks used are "overburned," curbs are crowded out, blocks are laid with lugs on adjacent sides, etc. The statements regarding expansion and complete filling of joints do not agree with the writer's observation. Our readers may be willing to enter into this discussion on one side or the other and give the results of their observation and experience.

Specifications for Asphalt Pavement.

To the Editor of MUNICIPAL ENGINEERING:

Sir—The writer very much appreciates the interest in this subject shown by your publication of his article in your last issue in connection with the Standard Specifications, and the editorial comment thereon.

An effort was made in writing the article referred to, to state in terse, vigorous English the basic principles upon which all mineral aggregates are mixed, whether the cementing material be an unyielding substance with a chemical set such as Portland cement, or a viscous substance with a temperature set such as the bitumens. How fully and completely the article was misunderstood will be plain to any one reading the editorial.

The writer did not "forget" that cement specifications went through the chemical stage. He well remembers that both asphalt and cement specifications "went" through the chemical stage. He uses the word "went" in the past tense, the ancient, old, useless and obsolete past. A past that has no business cumbering and retarding the progress of a present based upon ascertained and known principles. Let the dead past bury its dead.

Accurate, determined principles of engineering are no longer matters of opin-

ion. They are the basic fundaments of the science. No man submits the question of the product of 2x2 to the opinion or judgment of another. The binomial theorem is no longer a mooted question. The strength of steel beams is a determined factor in engineering. Equally determined and scientifically ascertained are the mixes which insure the maximum density in a mineral aggregate. Given the maximum size of the crushed rock, gravel or sand grains, and the percentages of each smaller size to make a mix of maximum density can be ascertained with mathematical exactness, and have been determined so long that they are no longer questions of opinion, but are an integral part of the accepted science of engineering.

Your editorial comment questions the statement that 1 to 10½ per cent. of bitumen will fill 25 per cent. of voids in sand. This is a same simple problem in mathematics. The specific gravity of sand is 2.6, of asphalt 1. Voids are ascertained by volume, pavement is mixed by weight. 2.6x10 equals 26. 2.6x10.5 equals 27.3. Both these percentages will fill the voids and have some to spare. There is no room for argument with the engineer who cannot see it. The fault is in his lack of capacity.

These graded aggregates are not "empirical formulae." They are the actual percentage of each size of material required to fill the spaces between the next larger pieces and so on down to the smallest sizes, filling the smaller void spaces with pieces of increasing fineness. Mr. Warren is correct in the principles announced for bitulithic pavement. The dense mix can be made, no matter how large the maximum particles. The percentages for concrete are set out in the following table.

CONCRETE MIXING.

Sift on coarser sieves first.

Passing.	Pct.	Pct.	Pct.	Pct.
2.5 in.	100	...	...	...
2.0 in.	89	100	...	...
1.5 in.	78	86	100	...
1.0 in.	63	71	82	100
.75 in.	55	60	70	86
.50 in.	45	50	58	71
.25 in.	31	35	40	50
.10 in.	20	22	24	31

The proper gradings for sand below 0.1 inch were set out in my former article.

The variations in sizes suggested by Mr. Smith do not tend to density of mixture. They are only an encouragement to the old lack of uniformity, to the old happy-go-lucky rule of thumb methods which have caused a pavement, which should last ten years without repair, to disintegrate within two years. The standard mixes can be made and kept uniform by any competent paving engineer. There should be no concession to "available source of supply."

Upon the same well established principles there is no room for discussion as to the propriety of laying the "binder course." There is no valid engineering excuse for binder. This is not stated as a mere assertion. It is stated as a scientific fact, based upon the principles which underlie all rigid construction. The writer has confirmed the principles in his experience of several years in laying hundreds of thousands of yards of the best asphalt pavement in the West.

Paraffin in asphalt will cause it to be "short" or lacking in ductility. Gilsonite fluxed with paraffin residuum will emulsify and lack ductility. The classical quantitative chemical analysis for paraffin scale is long, difficult and unsatisfactory. The simple test for ductility determines the acceptability of the asphalt. Too high a percentage of the volatile bitumens gives too high a penetration at the ordinary temperatures. The penetration and not the loss at 325 deg. F. for 5 hours determines this quality.

Again permit the suggestion that pavements be laid as a matter of municipal improvement, as a means of improving streets and making them passable, smooth, clean and sanitary, and that paving specifications be drawn to this end. It is not the purpose of paving specifications to build up the business of industrial chemists or "to eliminate chemists." By all means let us get back to a good asphalt pavement once more.

E. M. PERDUE,
Kansas City, Mo.

Our correspondent has made himself still clearer and has removed more of the opportunities for misunderstanding. He has reached the stage of physical tests not, perhaps, earlier than others, but he seems to be more willing to depend upon them to the exclusion of others, although he must still explain the reason for the showings which his physical tests make by the chemical composition of his material, as in the last paragraph but one. All the asphalt experts are on the same road, though few have traveled so far or are so radical in their positions. Possibly some of them will be interested enough to make their contributions to the discussion.

Municipality Not Liable for the Character of Its Water Supply.

The Oakes Manufacturing Company of Long Island City, N. Y., brought suit against the city, in which it was alleged that the quality of water supplied by the city was unfit for the manufacture of dye stuffs such as the concern manufactured. The company, which used about 50,000 gallons of water daily, asked damages to the amount of $300,000. The court held that in maintaining a water supply system for general public use the municipality acts as a governmental agent in the work of the state itself, and not as a proprietor engaged in a service for its own purposes and profit. Or, in effect, that a private concern cannot recover damages from a city caused by the failure of the municipality to supply wholesome water.

ROADS AND PAVEMENTS

Ann Arbor Concrete Pavement—Pennsylvania State Bridge—Earth Roads—Underground Street—Conneaut Brick Pavements

Tar Concrete Pavement in Ann Arbor.

A type of tar concrete pavement has been originated by Mr. Groves, city engineer of Ann Arbor, Mich., and about 18,000 square yards have been laid during the past eighteen months. The pavement is held to be very satisfactory and its cheapness has made it very popular. The 18,000 odd yards cost approximately $13,828.50. The same amount of brick paving would have cost $30,422.70. The difference that the city has saved is $16,594.20—more than enough to duplicate all the tar-concrete paving that has been laid. The same amount of asphalt block would have cost about $40,563.60. Figuring on this paving, the city has saved $26,735.10—within $1200 of enough to duplicate the present tar-concrete twice over.

The city engineer, who has not attempted to take out a patent on his idea, expects to attend the annual meeting of the American Road Builders' Association at Indianapolis, in December, and bring it to the attention of the delegates. So far the new pavement is far and away more popular than any other that has been used in the city. Every petition that has been circulated for paving in the city since the completion of the first street, has stipulated the use of tar-concrete.

First State Bridge in Pennsylvania.

The first bridge to be built by the state of Pennsylvania has recently been completed at Hammelstown. It was erected to replace a steel structure which was destroyed by a flood about a year ago. The State Board of Public Grounds and Buildings had charge of the work, and Mason P. Pratt of Harrisburg, Pa., was the engineer in charge.

The bridge is 311 feet in extreme length, with a twenty-foot clear roadway. The arches are built of concrete, with spandrel facing of five and ten-inch courses of brownstone, the courses being laid following the camber of the bridge. The curb and gutter, laid on top of the five-inch toothing course of brownstone, are made of concrete, upon which is set a sand-moulded railing made in five-foot sections. This railing is capped with a cut brownstone coping, nine inches in width over the railing and fifteen inches over the posts.

The posts are constructed of concrete, in each of which is inserted a brownstone keystone, emblematic of the state of Pennsylvania. In the center of the bridge are two Indian heads in bold relief made of molded concrete, indicative of the Indian name of the stream which the bridge crosses. The railings and posts were molded in sand forms, resulting in a very uniform and white concrete. The roadway is paved with vitrified brick, laid in hot pitch. The approaches are of macadam, carrying out uniformly the circular grade over the bridge. The Ferro-Concrete Company of Harrisburg were the contractors.

Earth Roads in Texas.

In speaking on the question of road construction, Robert J. Potts, of the A. and M. College of Texas, dwelt on the subject of earth roads. He did not attempt to class earth construction as superior to macadam or gravel roads, but merely offered a method of construction where the traffic was light and the money was not available for the more permanent construction. Mr. Potts remonstrated against the fact that attention was given entirely to the hard road construction; even the district road bonding law of Texas specifies that bonds may be issued for constructing "gravel, macadam or turnpike roads," with no reference to any other type.

Mr. Potts' paper is briefly abstracted as follow:

Granting that an earth road may be made firm and smooth, every one will admit its serviceableness. It is quiet, easy on the horse's feet, and its tractive resistance is actually less than almost any gravel road and is only equaled by the best macadam roads. This means that not only is the footing better for the horse, but the actual pull necessary for the horse to exert on the road is less for a dry, smooth, hard earth road than for most gravel roads. But it may be objected that it is not possible to have such earth roads under all conditions, and if it were possible, the expense of building them would be too great. My answer to this objection is that where the traffic is not extraordinarily heavy, a satisfactory earth road may be had under most soil conditions, and where it is adequate for the service required, it will, of course, be cheaper in first cost than any other type of road.

The next question which naturally presents itself is that of the permanence of earth roads. Many advocates of a bond issue would scout at the idea of an earth road being called a permanent improvement. Now the fact is there is no such thing as a "permanent road." When we use that phrase, we should always mean a road that may be permanently maintained. An earth road can be built in such manner that it may be permanently

maintained at a comparatively small cost, and every day's work put on the road should be done with this idea in view. So we must conclude that an earth road, built correctly, is really a permanent improvement and is entitled to consideration as such.

But granting that a perfect maintenance of the earth road would be more expensive than that of either the gravel or macadam road, we may consider that the difference in cost above mentioned, when saved to the community, is a principal, the interest on which could be called a maintenance fund. This maintenance fund could be collected as a tax, which would be higher than the tax necessary to meet a bond issue fund in the latter case. This interest on the net saving in cost should then be added to the cost of maintenance of the gravel or macadam road, to give the total maintenance allowable for the earth road. There can be no question that this amount would be more than sufficient to keep the earth road in perfect repair, and the community would be the gainer to the amount of the net saving in cost which constituted the principal in this calculation. Therefore, we conclude that it is the part of wisdom to choose the earth road in every case where it will meet the demands of the traffic to be carried.

When it comes to the technical side of this discussion, we can stop to mention only a very few of the leading points. A road should be located with regard to the topography of the country in order to insure ease of construction and of maintenance. This forbids the usual policy of locating the road along the land lines regardless of drainage, distance or heavy grades.

A sufficient width of right of way should be provided. Forty feet is the legal minimum for a first-class road and is recommended for most conditions. Having secured the proper location and determined the needed width for the traveled portion, the ditches should be located, all obstructions, such as stumps, removed, and the roadway proper given a uniform crown. Sand beds and soils that are too light to remain firm during the dry weather should have clay mixed with the native soil to form a wearing surface. If the soil is too heavy and sticky to be good in wet weather, sand should be put upon the surface and alowed to work in during the wet weather, care being taken to preserve the crown.

The ditches should be cut to a definite grade, that is, they should have a definite fall all the way to some natural drainage outlet. No road is properly drained when it is crowned up and side ditches are cut, unless these side ditches will empty themselves by continuous flow into the natural water courses. Again, these side ditches should not carry the water any further than is absolutely necessary to get it into some other outlet. "Ditch the side ditches" is a splendid epigram in road work.

It is here that the road drag becomes of value. After the road has been given the proper crown and its ditches properly constructed, it should be dragged after every rain while the soil is still soft and plastic. If properly done, this will not only prevent the formation of ruts and maintain the crown of the road, but each dragging of the wet surface makes it cake that much harder in the same way that the dirt cakes when plowed while too wet. This pudding action on the surface of the road after each rain gradually makes the surface harder and more impervious to water. And so the road gets better the longer the dragging is kept up.

For this purpose nothing is better than the simple split-log drag or a similar design made of 2x12-inch pine timbers. These homely road tools can be made at such a trifling expense that every overseer in the county should be provided with at least one of them. Then instead of "warning out all the hands" at one time to "work the road," one man at a time could be called upon to take the drag and go over all the road assigned to that overseer after each rain. The result of such systematic work on any road that has been properly graded, if continued for one year, will be truly gratifying.

Underground Street in New York.

Chief Engineer N. P. Lewis of the Board of Estimate and Apportionment of New York, has reported to the board that an underground street under Fort George Hill from Broadway to the subway station at the corner of St. Nicholas avenue and One Hundred and Ninetieth street is feasible. The subterranean street as planned will be between 800 and 900 feet long. It will be for pedestrian traffic only and it is estimated that it will cost about $800,000. The expense would be levied on the property benefited. Residents of the district who wish to reach the station have to climb the hill, which is 190 feet high, and then take elevators down to the station, which is 150 feet under ground. The new street would do away with the climb on the part of the residents in the Broadway district.—*Municipal Facts.*

Brick Pavements at Conneaut, O.

In the City of Conneaut, Ohio, are a number of examples of brick streets laid in a variety of different ways and with widely varying results as to durability. This conglomerate array of good, bad and indifferent brick pavements is, of course, not unusual, but to those who are interested in securing the best and most durable brick streets the following brief description of several sections may offer some facts worthy of consideration.

Main street in the business district of the town was paved about 16 years ago with repressed brick laid on a concrete base. Cement filler was used. No expansion joints were allowed either along the curb or across the street, and a few years after laying the pavement, quite naturally, became much warped and out of surface. After allowing this condition to exist for almost nine years the street was repaired by introducing adequate expansion joints, allowing the surface to settle, and then refilling where needed. The street is in fair condition today. In some places the filler has been chipped off and joints and edges exposed. Such defects apparently were due to careless laying and improper filling of joints.

Short stretches of Park avenue and Day street were paved eight years ago

with repressed blocks laid on gravel base with cement filler. The cost was $1.20 per yard. These sections are in practically perfect condition, although the traffic is comparatively heavy. Proper expansion joints were allowed on these sections.

State street, also, was paved eight years ago with repressed blocks laid on a gravel base. Cement filler was used except for four or five joints every 30 feet, which were filled with asphalt or tar to allow for longitudinal expansion. Transverse expansion was provided for by filling along the curb with asphalt or tar. This pavement is in good condition at present.

In the residence section on West Main street is a section paved ten years ago with repressed block laid on a sand base with cement filler. Apparently no attempt was made to provide for expansion and long irregular longitudinal cracks have appeared. In this pavement are shown many spots where imperfect filling was done. There are numerous examples of separate blocks which are in perfect condition on one side to which the filler still adheres, and in very bad condition on the other from which the filler has been chipped away. There are also shown examples where the brick were laid so closely together that no filler found its way between the blocks and consequent wearing of the edges and "cobbling" has occurred. There are, however, numerous places in this section where several square yards of the pavement are in imperfect condition.

Harbor street from the L. S. & M. S. railroad north was paved about two and one-half years ago with repressed block laid on a 6-inch concrete foundation. Asphalt filler was used. The cost was about $1.80 per yard. The surface is fairly smooth at present and along the curb and outer edges is in perfect condition. On the crown of the street, however, where the heaveist traffic occurs, much of the filler has disappeared and the edges of the blocks are fast becoming worn. In places no filler can be detected except by projecting a knife point or other sharp pointed instrument between the block to a depth of ½ or ¾ inch.

Harbor street from the L. S. & M. S. Railroad south was paved ten years ago with repressed blocks laid on a sand base with cement filler at a cost of $1.06 per yard. Although the traffic is the same as on the more recently paved section of Harbor street, this pavement has stood the wear much better and is still in good surface and good condition.

On West Main street in the outer residence section a brick pavement was laid about two and one-half years ago on a concrete base with an asphalt filler. The traffic is mostly automobiles and pleasure vehicles. This pavement is still in good condition, but in places the filler is beginning to disappear and the edges of the blocks are beginning to chip. This street along the curb is in perfect condition.

ORGANIZATIONS AND INDIVIDUALS

Standardizing Specifications—American Road Builders—Road Conference—California Surveyors—Board of Trade—Municipal Congress—Technical Schools—Charles H. Peters—Octave Chanute—Technical Meetings—Calendar of Meetings—New Mayors—Personal Notes

The American Road Builders' Association.

About one thousand delegates comprising highway officials, trustees, commissioners, engineers, contractors and automobile association representatives attended the sessions of the seventh annual convention of the American Road Builders' Association. The sessions were held in the German House, Indianapolis, on December 6-9 inclusive. An exhibit of road building materials and machinery was held in connection with the convention, at which were shown a number of novel and interesting features for road construction. The titles of the following papers which were given at the various sessions will serve to indicate the character of the organization and the value of the convention: "State Highway Legislation," Logan Waller Page, Director U. S. Office of Public Roads. "Relation of the City to its Adjacent Country Highways," A. B. Lea, Director of Public Service, Cleveland, O. "Highways of the Northwest," Samuel H. Lea, State Engineer of South Dakota. "Earth Roads," Charles P. Light, Commissioner of Roads, of West Virginia. "Present Highway Laws of Ohio and the Proposed New Law," James C. Wonders, State Highway Com-

missioner of Ohio. "Progress of the Good Roads Movement in North Dakota," T. R. Atkinson, State Engineer of North Dakota. "Bridge and Culvert Construction," W. S. Gearhart, State Highway Engineer of Kansas. "Progress of Road Building in Michigan," Townsend A. Ely, State Highway Commissioner of Michigan. "What State Aid Has Done in Maine," Paul D. Sargent, State Highway Commissioner of Maine. "Standard Specifications," James H. MacDonald, State Highway Commissioner of Connecticut. "The Father of Our Country as a Road Builder," T. Hugh Boorman, New York.

Over 1600 delegates were registered.

The exhibitors were the following:

Adams & Co., J. D., Indianapolis, Ind.
American Asphaltum & Rubber Co., Chicago.
American Association of Creosoted Wood Paving Manufacturers, Chicago.
American Paving and Manufacturing Co., Indianapolis, Ind.
American Sewer Pipe Co., Akron, O.
Atlas Portland Cement Co., New York.
Amies Road Co., Philadelphia, Pa.
F. C. Austin Drainage Excavation Co., Chicago, Ill.
Austin-Western Co., Ltd., Chicago.
A. & C. Stone & Lime Co., Indianapolis, Ind.
Barber Asphalt Paving Co., Philadelphia.
Barrett Manufacturing Co., New York.
Burch Plow Works, Crestline, O.
Case Threshing Machine Co., J. I., Racine, Wis.
Collapsible Steel Form Co., Detroit, Mich.
Crawfordsville Corrugated Culvert Co., Crawfordsville, Ind.
Du Pont de Nemours Powder Co., E. I., Wilmington, Del.
Geiser Mfg. Co., Waynesboro, Pa.
G. F. W. Co., Saratoga, N. Y.
Huber Mfg. Co., Marion, O.
Iroquois Iron Works, Buffalo, N. Y.
Kelly-Springfield Road Roller Co., Springfield, O.
Lehigh Portland Cement Co., Allentown, Pa.
Municipal Engineering Co., Indianapolis, Ind.
Municipal Engineering & Contracting Co., Chicago.
National Bitumen Co., Indianapolis, Ind.
National Paving Brick Manufacturers' Association, Indianapolis, Ind.
Port Huron Engine & Thresher Co., Port Huron, Mich.
Quenner Dry Crusher Co., New York City.
Rauschenbach Construction Co., Evansville, Ind.
Robeson Process Co., Au Sable Forks, N. Y.
Rugg'es Coles Engineering Co., New York.
Standard Oil Co., New York City.
Stark Rolling Mill Co., Canton, O.
The Kindling Machinery Co., Milwaukee, Wis.
Texas Co., New York City.
Warren Bros. Co., Boston.
Watson Wagon Co., Canastota, N. Y.
Yellow Pine Manufacturers' Association, St. Louis.

California Surveyors Organize.

County surveyors from all parts of California have formed a state association, the object of which will be to discuss the different engineering problems that confront them in line with their duties, and to arrive at a uniform system in the matter of selecting plans and specifications for bridges, culverts and other engineering work, for which bids are invited by the counties of the state.

The organization was effected at a meeting held in the Alaska building, San Francisco, on December 17. J. G. McMillan of San Jose, was elected president, P. A. Haviland of Oakland, vice president, and F. S. Miller of Sacramento, secretary.

A committee on by-laws was named, consisting of President McMillan, Vice President Haviland, Mr. Aeger of Solano, Mr. Quail of San Joaquin and Mr. Cowell of Merced. This body will report back at the next meeting, which will be held at the call of the president. A committee on legislation, consisting of seven of the oldest county surveyors of the state, was also appointed to attend to matters that come before the legislature affecting the office of county surveyor.

The next meeting of the association will be held early in the new year, when papers will be read before the members, prepared by men who are prominent in different lines of engineering.

A Live Board of Trade.

A small handbook or directory of the Board of Trade of Winston-Salem, North Carolina, is a voltmeter which indicates that the organization is thoroughly alive. One indication of this is the fact that the membership has increased from 168 on Oct. 1 to 600 on Dec. 15. Mr. J. L. Ludlow, consulting engineer, is president of the organiation.

International Municipal Congress and Exposition.

Although far in advance of the time set, the Chicago Association of Commerce is already making active preparations for the International Municipal Congress and Exposition which is to be held in that city on September 18-30, 1911. This Congress and Exposition will cover in a practical as well as theoretical manner matters of interest to all branches of municipal service. Upon each day of the Congress papers will be read and discussed by prominent municipal officials, and prominent municipalities of this country and foreign countries will have attractive exhibits of municipal undertakings in which they excel. The manufacturers of municipal appliances will have elaborate exhibits that will interest and instruct municipal officials everywhere. Edward H. Allen, 77 Jackson Blvd., is general manager. John MacVicar, one of the commissioners of Des Moines, Ia., as noted elsewhere, has been selected as Commissioner General of the exposition.

Organization of City Officials for the Standardizing of Paving Specifications.

The second annual meeting of the Organization of City Officials for Standardizing Paving Specifications will be held at the Hotel Astor, New York City, beginning Tuesday, January 10th and extending through the remainder of the week.

The organization represents thirty American cities with five associate members. The work outlined at the preliminary convention at Chicago in February last has been perfected by the various committees, and final reports for complete specifications will be adopted at this meeting.

Any city is eligible to membership upon payment of dues, and is entitled to as many delegates as it may choose to appoint; but in voting, each city has but one vote.

The Secretary is John B. Hittell, City Hall, Chicago. Any mail dated after January 4th, 1911, should be sent him care Hotel Astor, New York City.

Road Conference of the American Society of Civil Engineers.

The American Society of Civil Engineers will hold three meetings for discussing road construction and maintenance. These meetings will be held at the house of the society, 220 West 57th street, New York city, on January 20 and 21, the days following the annual meeting of the society. The topics to be discussed are as follows:

(1.) Preliminary investigations.
(2.) Relative value of three methods of carrying on work:
(a) That in which both labor and material are furnished by the contractor.
(b) That in which the material is supplied by the party of the first part and the labor by the contractor.
(c) That in which both the labor and material are supplied by the party of the first part.
(3.) Systems of maintenance.
(4.) The use of water, calcium chloride, light oils, etc., as dust palliatives.
(5.) Surface treatment with tars, heavy oils, etc.
(6.) The use of bituminous materials by penetration methods.
(7.) The use of bituminous materials by mixing methods.

The discussion on each of the above topics will be presented by an engineer specially selected for that purpose, and such presentation will be limited to ten minutes; the discussion of each of the subsequent speakers will be limited to five-minute talks.

The Technical Schools.

The December issue of *"The Wisconsin Engineer,"* a publication of the University of Wisconsin, contains a number of articles of interest to the engineer.

The forty-first annual catalogue of the Worcester Polytechnic Institute has recently been issued. Courses in Civil, Mechanical and Electrical Engineering, and in Chemistry and general science are described.

The Colleges of Engineering of the University of Illinois and Purdue University arrange each year a series of exchange lectures delivered by the members of the faculty of each institution. The first lecture delivered at Illinois this year was by Prof. C. R. Moore of Purdue on "Power Manufacture and Its Dangers."

Dr. J. A. L. Waddell, the noted bridge engineer of Kansas City, recently delivered two lectures before the faculty and students of the College of Engineering of the University of Illinois, one a technical talk on "Materials of Bridge Engineering and Foundations" and the other a general lecture on bridge construction.

Charles H. Peters.

Charles H. Peters, one of the leading men in the municipal affairs of Saginaw, Mich., died at his home in that city on November 12th. Mr. Peters was for a number of years associated with the Saginaw Enterprise, and the Saginaw Evening News, in which work he did much to advance the civic affairs of his city. For a number of years he was a member of the Board of Education and was on the building committee, personally drawing the preliminary plans for a number of the school buildings of the city.

He was appointed as a member of the board of park and cemetery commissioners by Mayor Henry E. Lee and was reappointed January 1, 1909, for a five-year period.

At the time of his death he was engaged in the printing business with the firm of Seeman & Peters.

Octave Chanute.

Octave Chanute, Past President of the American Society of Civil Engineers, died at his home in Chicago on November 23. He was born in France in 1832, and was brought to this country in 1838. His engineering career commenced in 1849, when he was engaged on the Hudson River Railway under the late John B. Jarvis, then Chief Engineer. After this Mr. Chanute came to Illinois and engaged in the construction of a road between Joliet and Bloomington. Following this he was engaged in railroad work with various companies until in 1889 he established a consulting office in Chicago, giving especial attention to the question of wood preservation, a subject with which he was thoroughly familiar and which he brought to the attention of many engineers.

Of late years he had taken active interest in the development of aviation, and the present success of the flying machines of the aeroplane type is due largely to the work of Mr. Chanute. When in Paris last summer he contracted pneumonia, and had a very serious illness. He re-

turned to this country in October, but was unable to regain strength and died practically of extreme weakness and exhaustion.

Funeral services were held at the residence on November 25, at which a number of prominent engineers and associates of Mr. Chanute were present. The burial was at Peoria, Ill., on November 2.

Technical Meetings.

The eleventh annual meeting of The National Civic Federation will be held in New York City, January 12, 13 and 14, 1911, at Hotel Astor. The questions to be discussed are: "Regulation of Corporations and Combinations," "Regulation of Railroads and Municipal Utilities," "Compensation for Industrial Accidents," and "Arbitration and Conciliation." Leading men from different parts of the country will speak on the various topics and their names will be announced in the near future. There will, also, be occasion for general discussion at each session.

At a regular meeting of the Municipal Engineers of the City of New York, held at the Engineering Society's Building on December 28, 1910, Mr. F. S. Cook presented a paper on the "Construction of the Croton Falls Reservoir of the City of New York Water Supply."

Nebraska and western Iowa are to give an exposition in Omaha February 1, 2 and 3 of next year, to be known as the Mid-West Cement Exposition, and The Nebraska Cement Users' Association has secured the Omaha Auditorium for the show. H. G. Calkins of the Nebraska Superior Portland Cement Company has been made chairman of the general arrangements committee for the exposition with F. W. Whipperman of the Omaha Concrete Stone Company as secretary.

In connection with the convention of the American Association of Cement Manufacturers held in New York City, lectures were given in Madison Square Garden Concert Hall, at 3 p. m. and 8:30 p. m., except Thursday and Friday evening and Sunday. The following were the topics considered: "Transportation Terminals," Calvin Tomkins, Commissioner of Docks and Ferries of New York City; "Fireproofing Materials," Rudolph P. Miller, Commissioner of Buildings, New York City; "The Largest Commercial Building in the World," J. Hollis Wells; "Large Reinforced Concrete Buildings," E. P. Goodrich, Consulting Engineer, New York City; "The Part Played by Concrete in Rural Highways," Logan Waller Page, Director of Public Roads, U. S. Department of Agriculture; "The Age of Cement" (lecture in the German tongue), Charles Wisch, former Chief Municipal Architect, Cologne, Germany.

A convention of the Washington State Good Roads Association was held at Walla Walla, on December 1. A great deal of contention was stirred up at this convention relative to a state aid road law. A majority and a minority committee report was presented for the sake of debate. It was decided to draft and present a bill to the legislature embodying the most practical methods for securing good roads. The following officers were elected for 1911: R. H. Thomas, Seattle, president; J. J. Donovan, Bellingham, first vice president; H. A. Reynolds, Walla Walla, second vice president; H. H. McGowan, Tacoma, third vice president; P. W. Cox, Colfax, fourth vice president; E. M. Gillette, Wenatchee, fifth vice president; J. C. Scott, treasurer.

In conjunction with the New York Cement show held in Madison Square Garden December 14-20, was held the seventh annual convention of the National Association of Cement Users. A number of delegates were present from foreign concrete associations, municipalities and governments. The Austrian Concrete Association (Oesterreichischer Beton Verein) was represented by Dr. Karl Bittner, its director, and Dr. Franz Boehm, engineer, both of Vienna Austria; the German Concrete Association (Deutscher Beton Verein) by Dr. Otto Schott, of Heidelberg, and the French Society of Civil Engineers (Societe des Ingenieurs Civils de France) by M. Joseph Boreo, of Neuilly. M. Baneth acted as special representative of the Lord Mayor of Budapest, Hungary.

Calendar of Technical Meetings.

Canadian Society of Civil Engineers.—Annual meeting, Winnipeg, Manitoba, Can.—C. H. McLeod, Secretary, 413 Dorchester street, West, Montreal, Que., January 2-6.

American Society of Engineering Contractors.—New York City.—D. J. Hauer, Secretary, January 10-11.

Organization of City Officials for Standardizing Paving Specifications.—Conference, New York, N. Y.—B. T. Fendall, City Engineer, Baltimore, Md., Chairman of Committee. January 10-15.

National Tariff Commission Association.—National Convention, Washington, D. C.—Henry T. Wills, Secretary, 66 Lafayette street, New York, N. Y. January 11-12.

Michigan Engineering Society.—Annual Meeting, Lansing, Mich. January 11-13.

New York Tax Reform Association.—State Conference on Taxation.— A. C. Pleydell, Secretary, New York, N. Y. January 12-13.

Indiana Engineering Society.—Annual Meeting, Hotel Denison, Indianapolis.—Charles Brossman, Secretary, Union Trust Building, Indianapolis, Ind. January 12-14.

National Civic Federation.—Annual Convention, New York, N. Y.—D. L. Case, Secretary, 1 Madison avenue, New York, N. Y. January 12-14.

Montana Society of Engineers.—Annual Meeting, Helena, Mont.—Clinton H. Moore, Secretary, Leysen Block, Butte, Mont. January 12-14.

Canadian Cement and Concrete Association.— Annual Convention and Exhibition, Toronto, Ont.—R. E. W. Hagarty, Secretary, 662 Euclid avenue, Toronto, Ont. January 16-20.

Engineers' Society of Western Pennsylvania.—Annual Meeting, Pittsburg, Pa.—

Elmer K. Hiles, Secretary, 803 Fulton Building, Pittsburg, Pa. January 17.

American Institute of Architects.—Annual Convention, San Francisco, Cal.—Glenn Brown, Secretary, Octagon, Washington, D. C. January 17-19.

American Society of Civil Engineers.—Annual Meeting, New York.—C. W. Hunt, Secretary, 220 West 57th street, New York. January 18-19.

Illuminating Engineering Society.—Annual Meeting, New York, N. Y.—P. S. Millar, Secretary, 29 West 39th street, New York, N. Y. January 20.

Ohio Engineering Society. — Annual Meeting, Columbus, O.—C. J. Knisely, Secretary, New Philadelphia, O. January 24-26.

Illinois Society of Engineers and Surveyors.—Annual Meeting, East St. Louis, Ill.—E. E. R. Tratman, Secretary, 1636 Monadnock Block, Chicago, Ill. January 25-27.

The Nebraska Cement Users' Association and the Mid-West Cement Exposition. — Omaha, Neb. — F. W. Whipperman, Omaha Concrete Stove Co., Secretary, February 1-2-3.

National Brick Manufacturers' Association.—Annual Convention, Louisville, Ky. —T. A. Randall, Secretary, Indianapolis, Ind. February 6-11.

American Water Works Association.—Annual Convention, Rochester, N. Y.—J. M. Diven, 14 George street, Charleston, S. C. May 29.

New Mayors Elected.

Portland, Me.—Oakley C. Curtis.

Brockton, Mass. — Former Alderman Harry C. Howard.

Fall River, Mass.—Thomas Higgins.

Fitchburg, Mass.—M. Fred O'Connell, re-elected.

Gloucester, Mass. — Alderman Isaac Patch.

Haverhill, Mass.—E. H. Moulton.

Holyoke, Mass.—Alderman John J. White.

Lawrence, Mass.—John T. Cahill, re-elected.

Mariboro, Mass.—John J. Shaughnessy, re-elected.

New Bedford, Mass.—Charles S. Ashley, re-elected.

Northampton, Mass.—Calvin Coolidge, re-elected.

Pittsfield, Mass.—Kelton B. Miller.

Quincy, Mass.—William T. Shea, re-elected for the fourth term.

Springfield, Mass.—Edward H. Lathrop, re-elected.

Waltham, Mass.—Edward A. Walker, re-elected.

Port Huron, Mich.—John J. Bell, re-elected under Commission government, with Sam O. Aikman, Andrew J. Smith, F. J. Dixon and Charles E. Mudford as Commissioners.

Rochester, N. H.—Joseph Warren, re-elected without opposing vote.

Newport, R. I.—Patrick J. Boyle, for fifteenth term.

Personal Notes.

Mr. E. N. Chisolm, superintendent and engineer of the Knoxville, Tenn., water works, has resigned to enter private practice as member of the firm of Chisolm & Osborne, civil and hydraulic engineers.

Mr. James A. Bell, for the past twenty-five years city engineer of St. Thomas, Ont., has resigned to enter private practice.

Harrison P. Eddy, Boston, Mass., has been retained by the Sewerage Commission of Fitchburg, Mass., to investigate and report on the city's sewage disposal problem.

Mr. Robert M. Clayton, city engineer, Atlanta, Ga., has appointed Mr. W. T. B. Wilson, assistant engineer in charge of sewers, Mr. N. Hurt assistant in charge of streets and Mr. T. Wilson assistant in charge of sidewalks.

Mr. A. B. Alderson, who for the past twelve years has been engaged as engineer for the town of West Hartford, Conn., has established an office for the practice of civil engineering, at 49 Pearl street, Hartford, Conn.

Mr. B. B. Lathbury, consulting engineer, formerly president of the firm of Lathbury & Spackman, Inc., has merged his interests with the D'Olier Engineering Co. under the firm name of The Lathbury-D'Olier Company, Engineers.

Alexander Potter, consulting engineer, of New York City, has been retained by the City of Muskogee, Okla., to design a water supply system, and a sewerage system and disposal plant for a population of 150,000. The present population is about 28,000.

Irving W. Patterson, Jun. Am. Soc. C. E., has recently resigned from the position of Resident Engineer with the State Board of Public Roads of Rhode Island to accept the position of Assistant Engineer with Arthur H. Blanchard, Consulting Highway Engineer, Providence, R. I.

D. J. Whittemore, chief engineer of the C. M. & St. P. Ry., has resigned from active service to take up study and investigational work. Mr. Whittemore is a member of two of the greatest engineering bodies in the world, the Institution of Civil Engineers of Great Britain, and the American Society of Civil Engineers.

Arthur H. Blanchard, M. Am. Soc. C. E., Associate Professor of Civil Engineering, Brown University, Providence, and consulting highway engineer, has recently been appointed Expert and Consulting Engineer to the United States Office of Public Roads by the Secretary of Agriculture and the Director of the Office of Public Roads.

John MacVicar, of Des Moines, Ia., has been selected Commissioner General of the International Municipal Congress and Exposition to be held in Chicago, September 18-30, 1911. John MacVicar is one of the best known workers in this country on the lines of municipal government and the administration affairs of cities. He has been in active service in municipal work for more than twenty years. He was named to the office of President of The League of American Municipalities upon its organization, and has ever since been actively connected with it for the past ten years as Secretary. Mr. MacVicar is at present a member of the Commission, and Superintendent of Streets and Public Improvements, at Des Moines, Ia.

MACHINERY AND TRADE

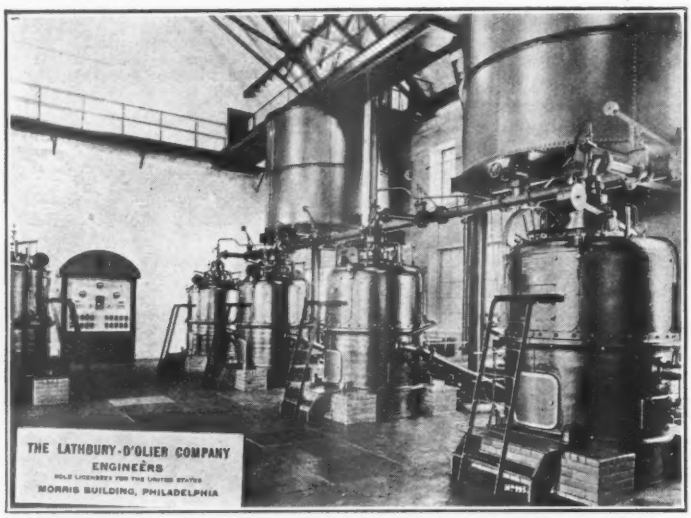
A Centrifugal Machine for the Drying of Sludge.

The Lathbury-D'Olier Engineering Company, of Philadelphia, have purchased the rights on a new centrifugal sludge-drying machine, which has been in use in Europe for a number of years. The company is arranging to manufacture the machines in its own plant at Philadelphia, but at present has some of them on hand of European manufacturers.

The apparatus is built as a continuous drying machine, working automatically and acting in two distinct and constantly repeated periods. During the first period the sludge is introduced into the machine and dried by the action of centrifugal force, which extracts the water contained in it. During the second period the solid dried residue is automatically ejected from the machine.

The drum of the centrifugal machine is fitted with a central tube for the introduction of the raw sludge, and contains a number of chambers. The latter are provided with sieves, and each is fitted with an inner and outer checking device. The process of drying may be described as follows:

While the machine is rotating the sludge is allowed to flow into the chambers from a reservoir fixed above the former, the inner valve being open. The heavy solid matter contained in the sludge is projected by centrifugal force toward the outer part of the chambers, while the water, the specific gravity of which is less, is forced back, and thus separated from the solid matter. The separated water passes through the sieves and flows off by an annular canal into the shell of the apparatus. Fresh sludge now enters the chambers through the delivery pipe to replace the separated water, so that these chambers are filled up completely in a comparatively short time with material from which the water has been extracted and which is now air dry. As soon as this stage of the process is reached the inner slide is closed, thus cutting off the feed and separating the dried matter in the chambers from the raw sludge in the delivery pipe.



CENTRIFUGAL SLUDGE DRIER AT FRANKFORT-ON-THE-MAIN, GERMANY.

The outer slide is now opened and the dried matter is ejected by centrifugal force. This matter strikes the walls of the shell, is broken up into small pieces and falls into barrows which take it to a conveyor. As soon as the outer slide has been closed and the inner one opened the different stages of the process are repeated.

As the composition of sludge varies so

much, from day to day, and even during the different hours of the day, it is difficult to give any figures of output for the machine. In installations now in operation from 70 to 140 cubic feet per hour of raw material have been treated, giving a residue of dry sudge weighing from 660 to 1,000 pounds. The power required to operate varies from 8 to 10 horse power.

There are at present a number of the machines in use in Europe, some of which will be described in a later issue. The accompanying photograph is that of a plant in Franfort-on-Main, Germany. Through the courtesy of the local officials of that city, the first of the machines was installed for practical experimental purposes. Since the development of the machine others have been installed until the plant is at present as shown.

The Marriott Curb Conduit System.

The accompanying illustration shows the Marriott curb-conduit system, which in addition to being a curb as is indicated has practical utilitarian uses. It is made of concrete with metal covers, which as are shown are surfaced with concrete in such a way as to make the metal a protector for the edges of the curb. This conduit feature of the system has three practical uses, namely, surface drainage, street cleaning and snow removal.

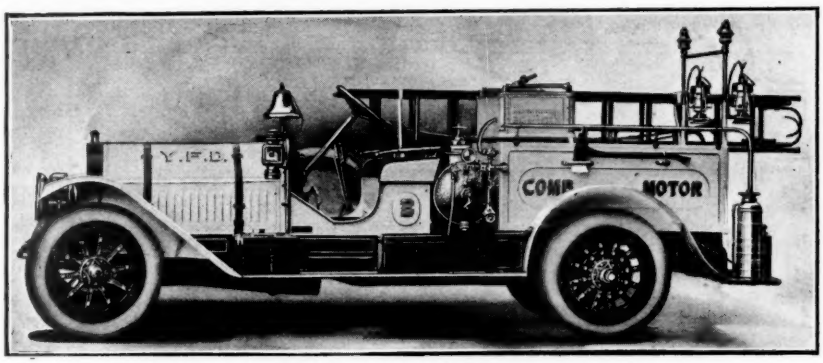
The operation of the conduit in the removal of surface water is obvious. It provides a free channel for the flow, with practically continuous openings for inlet, abolishing the frequent trouble with clogged inlets and the consequent backwater pools which often extend over the tops of the gutter plates at street crossings. The surface gutter stream is, of course, abolished.

With reference to street cleaning, the conduit system makes it possible to not only sweep the streets, but allows them to be thoroughly washed without the attendant evils of side gutters filled with water, or with the filth left after the subsidence of the water.

With regard to snow removal, the conduit system is admirably adopted for one of the best practical methods of accomplishing this work. The method in most common use for the removal of snow is that of hauling it from the streets in wagons to some more or less convenient dumping ground, where it may be disposed of. To any one who has been in any of the larger cities even a week after a ten or twelve-inch snow fall, the tediousness of such procedure is apparent.

Other means for snow disposal can be classified under two general divisions:

1. Those devices which use heat derived from burning oil, steam or electrical energy to melt or "fry" snow, and then discharge the resulting water into the sewers; and



BOYD'S MOTOR FIRE TRUCK.

Yonkers Motor Fire Apparatus.

The automobile combination chemical engine and hose wagon shown in the accompanying illustration is one of two recently delivered to the city of Yonkers, N. Y., by James Boyd & Bro., Inc., of Philadelphia. The specifications and equipment are as follows:

Motor—6 cylinder, 70 horse power, 4 cycle, vertical type; water cooled.

Transmission—Sliding gear, selective type; four speeds forward and one reverse.

Drive—Double chain drive from jack shaft to rear wheels.

Tires—38 inch by 5½ inch; demountable rims.

Hose Body—Capacity 1,000 feet of 2½-inch fire hose.

Chemical tank—One 40-gallon copper tank, Holloway type, with pressure gauge, controlling valves and by-pass connection.

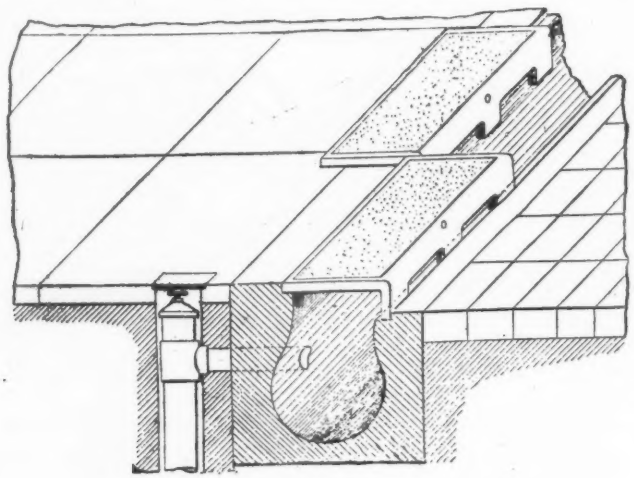
Hose Basket—Made of sheet steel having a capacity of 200 feet of ¾-inch chemical hose.

Equipment—200 feet ¾-inch chemical hose with shut-off nozzle and three extra tips; 1 20-foot rope hoist extension ladder; 1 12-foot roof ladder; 1 12-inch locomotive bell, mounted on dash; 2 3-gallon Boyd plunger fire extinguishers; 2 fire department lanterns; 2 fire axes; 2 10-inch electric headlights; 2 side oil lamps.

2. Curb conduits flushed with running water, into which snow is shoveled and converted into thin slush, which flows rapidly to the sewers.

In steam and electrical devices for melting snow the plant is used but a few days in each year; during the remaining 320 or 330 days of each year it remains idle and useless under wear and tear, depreciation, interest, storage and other charges.

The Marriott curb conduit system comes under subdivision No. 2. It is without the objections urged against the other type, in that it is useful throughout the entire year for the purposes of snow removal, surface drainage and street cleaning. It combines in a single unit the equipment for ideal municipal sanitation in these fields. Furthermore, it obviates the traffic con-



THE MARRIOTT CONCRETE CURB CONDUIT.

gestion occasioned by the use of horses, teamsters and vehicles. As it removes snow, obviously at minimum cost, it seems to solve the problem of snow removal and municipal sanitation. To dispose of snow, mechanical sweepers (or other means) heap it near the curb conduit. When so piled in any section, water from the supply mains, shown at the left of the conduit section, is admitted to the conduit; and the snow is shoveled thereinto, to be partly melted by the heat latent in subsurface water, and wholly transported by the flow of the same.

Its efficacy in snow removal is made clear by the following considerations:

1. Will water run down grade?
2. Will snow and ice float in water?
3. Will such floating snow and ice be transported in running down grade?
4. Is it possible in 90 seconds to freeze a stream of water twelve inches wide and six inches deep, moving with a velocity of 200 feet per minute in a conduit?

Other points in favor of the system make themselves apparent upon study, inasmuch as the form of construction lends itself readily to the plan of having wire and other conduits set in the concrete under the flow line of the water conduit as is shown in the illustration. James C. Marriott, Park Row Building, New York City, is the patentee and manufacturer of the system.

Basic Bitulithic Patent Sustained in New York.

In granting the plaintiffs an injunction in the case of Warren Brothers Company vs. The City of New York and Uvalde Asphalt Paving Company of New York, Judge A. C. Coxe of the U. S. Circuit Court of the Southern District of New York has covered a number of points which have been under discussion recently in conventions and in MUNICIPAL ENGINEERING. The following extracts from the opinion may serve to show the method of treatment:

This court must, therefore, consider as established the following propositions, which were at issue in the Owosso case.

First. The validity of the patent.

Second. That the patent is not invalid for double patenting.

Third. That the patent is not anticipated by any of the alleged prior uses proved in the Owosso case.

This leaves only to be considered the Washington, Chicago and Cincinnati prior uses and the question of infringement.

I have examined the affidavits and the specimens taken by both sides from the Washington pavements and am confident that the testimony does not establish anticipation beyond a reasonable doubt. Some of the specimens produced by the defendants have a general resemblance to the patented composition. Others,

taken by the complainant from the same locality, have no resemblance to the particular features upon which patentability rests.

The fact that the samples furnished differ so materially in structure and appearance seems to indicate that the influence of heat and cold and the use of the streets for heavy traffic during long periods of time have worked changes in these pavements, so that their present structure is not what it is when originally laid. The pavement on Corcoran street, for instance, is shown to have been laid under the patent to Scharf, which provides three distinct layers. It would not avail the defendants if they were able to show that in the process of time, these layers have in some places been broken up and something resembling the complainant's structure has thus been sporadically produced. This would not be a prior use, but a prior misuse.

The Cincinnati use is even more remote. The pavement there is laid in blocks and is not intended at all for vehicular traffic. The Chicago uses need not be discussed as they are no better references than

WARRENITE PAVEMENT, TRENTON, N. J.

those to which attention has been called. It is enough to say that in my judgment the proof does not establish the invalidity of the patent beyond a reasonable doubt.

The claims in issue are for a product, not a process. Of course the claims must be read in the light of the description, but it cannot be doubted that anyone using the Warren pavement will infringe, no matter how the pavement is produced. For instance, the specification says, "It is desirable to have the mineral aggregate rich in particles of the size passing the 200, 100 and 80 mesh sieves," but if the mineral particles are of the indicated size, it is immaterial whether they have passed through a sieve or not. We are dealing with a pavement, not the method of producing it.

On the part of the defendants a large number of experts of high standing and ability state that the use of the stone as it comes from the crusher without screening, sifting or selecting, takes the proposed pavement out of the claim of the Warren patent. But this is all matter of opinion, where something more than opinion is required. The defendants should show the court the pavement which they propose to lay. It does not materially aid the investigation to show what they do not propose to lay. The complainant has produced exhibits in which the crusher run was used, which seem to conform to the structure of the patent. The defendant has produced no sample of its proposed pavement.

As it is said that thousands of yards have been laid in Washington and elsewhere under specifications substantially similar to those in the case at bar, it would seem that the production of such a sample would not have been difficult.

Advanced Curb and Gutter Construction.

Each new form of construction which receives the stamp of approval, after a thorough trial, brings into existence methods and appliances for building it economically. The concrete curb and gutter has come to be generally accepted as the best construction for all kinds of pavement; but, until very recently, the slow and uneven hand methods of construction have hindered its full development on account of uneven surfacing and bad alignment.

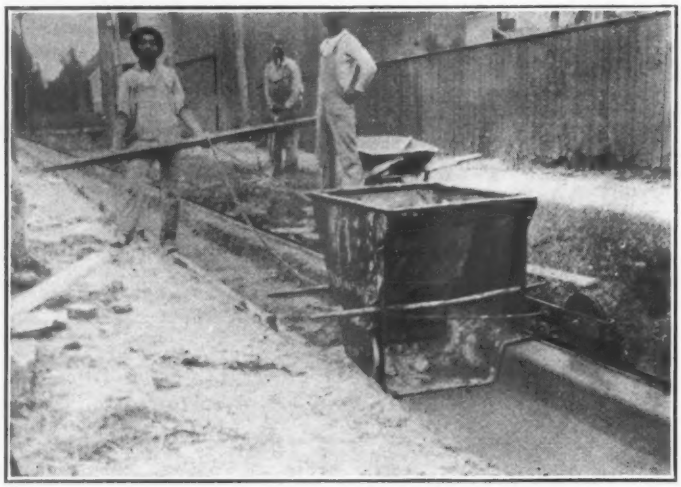
A machine for building cement curb and gutter has been placed on the market which not only accomplishes the purposes for which it is intended in a rapid and economical manner, but also attains a perfection of construction which cannot be reached by the older methods. This machine, shown in the accompanying photograph, was invented by a practical contractor, who realized the needs of more efficient methods in this work.

The machine is supported on three wheels, two of which run along the back board of the curb and the third moves on the gutter boards. The two rear wheels are grooved and follow a light steel rail, which is easily and quickly attached to the back board. The frame to which these wheels are attached is braced rigidly assuming a perfect alignment and grade, free from minor irreg-

ularities. The second photograph shows this rigidity of construction.

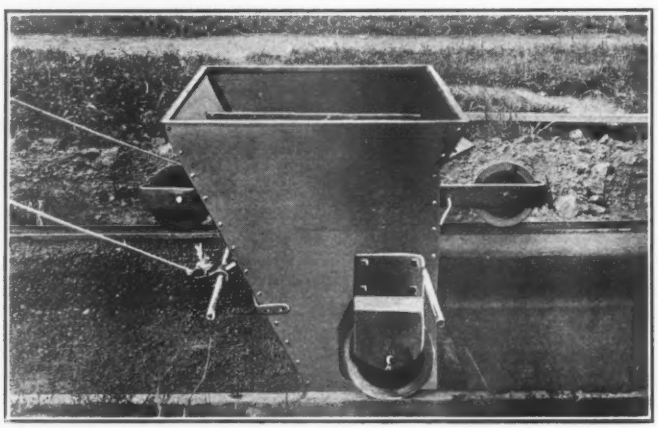
The method of operation is illustrated by the second cut. The finishing material is placed in the hopper, and the machine is drawn along with a slow, uniform speed allowing the mortar to flow down upon the base. The heavy phosphor-bronze spreading and finishing plate forces the mortar into proper shape under pressure and finishes the surface superior to any obtainable by hand troweling. As will be noted, the design of this finishing plate allows of the batter upon the face of the curb, which is now so strongly advocated for strength and protection of the curb edges against scarring and abrasion. The machine is manufactured in different sizes to fit the various specifications. The type shown constructs a 6-inch by 6-inch curb with an 18-inch gutter, the over-all dimension being 25¾ inches.

The capacity of the machine is limited only by the amount of base that can be prepared for it. With a gang of eighteen men, one machine in Evansville, Ind., averaged between 900 and 1,000 feet per day of 6-inch by 24-inch work, with an absolute uniformity and excellence of finish. Two unskilled laborers operated this machine.



RAUSCHENBACH CURB AND GUTTER MACHINE.

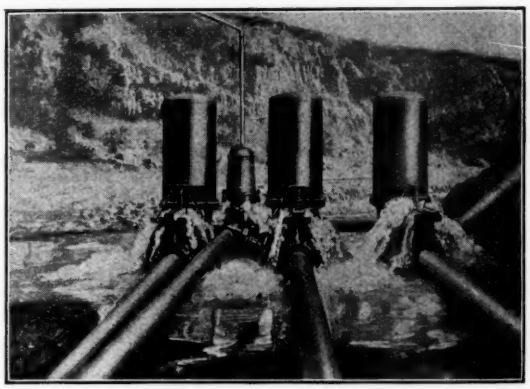
The advantages of the appliance will be at once apparent. It assures an excellence of finish, free from hollows or ridges, unattainable by hand methods. A perfect grade and alignment is obtained. A wet mixture may be used on the base, assuring a better bond between base and surface. The machine requires no adjustments, is of solid, lasting construction and may be operated by cheap



RAUSCHENBACH'S CURB AND GUTTER MACHINE.

labor. The rapid work, simplicity of operation and the fact that all the mortar is put in place without waste, all contribute to the economy of its operation.

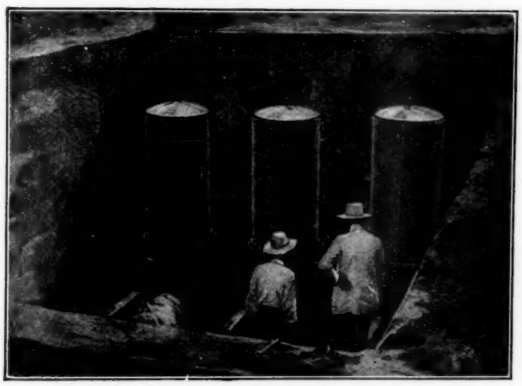
The appliance is handled by Thomas L. Barret, general sales agent, Board of Trade, Louisville, Ky., who will furnish information regarding it upon application.



I. RIFE RAM INSTALLATION AT APIZACO, MEXICO.

Hydraulic Rams.

There has been but little advancement in the design of hydraulic rams since their invention in 1776 by Montgolfier, until of late years the Rife Engine Co., of 111 Broadway, New York City, have developed and made them practical for use in supplying water economically for small plants or country estates. The Rife ram is now built with automatic air feeding device, preventing water-logging and consequent destruction by concussion, and are successfully used for town water works, irrigation, railroad tank supply, as well as for farms, domestic purposes, etc. There are thousands of locations where it is desired to elevate water, where the cost of fuel and attendants is prohibitory, and where there is running water with two or more feet fall to operate a ram. With this system land lying above irrigating ditches or streams is even more valuable than the land below the ditches, particularly for fruit orchards.



II. RIFE RAMS IN COLOMBIA.

The Rife ram is built in sizes varying in capacity from three gallons to 700 gallons a minute; they will operate under two or more feet fall and elevate water 30 feet for each foot of fall used, developing an efficiency of from 60 to 90 per cent, according to the ratio of fall to pumping head.

The first accompanying illustration shows a battery of three No. 80 Rife rams, with a capacity of 300 gallons a minute each, all pumping through one pipe a distance of 10,000 feet, supplying the carshops, railroad tank and town of Apizaco, Mexico.

The Colombian government, five years

ago, installed three No. 120 rams with a capacity of 700 gallons a minute each, delivering water through a pipe line 13,000 feet long to an elevation of 262 feet. This installation is shown in the second illustration.

The third photograph is that of two No. 40 Rife rams supplying water to a railroad tank for the Pennsylvania Railroad Company at Claysburg, Pa. The

III. RIFE RAMS IN CLAYSBURG, PA.

folowing are operative data for this installation:

Water used, 120 gallons per minute.
Fall used, 12 feet.
Elevation, 39.4 feet.
Amount delivered, 28 gallons per minute.
Efficiency, 77 per cent.

Full information and catalogues may be had upon application to the above-mentioned manufacturers.

Smoke Prevention.

At the present time when the term "city beautiful" has come into such common usage as to almost fall into disrepute, a great deal of attention is given to keeping our streets and boulevards clean and free from litter of all descriptions. But in only a few cities are there measures taken to keep the air clean and the sky-line as free from the dirt and the nuisance of smoke. True, there are in most cities ordinances which make the manufacturer who besmirches the air with coal smoke a law breaker and an offender against public policy. But even in the cities where these laws are enforced there are sufficient instances of violation to often cause newspaper mention and unpleasant notoriety to all concerned. The reason for this violation is not from the fact that the manufacturer is voluntarily allowing all the black smoke which represents power to be discharged into the air, but for the reason that no economical method has been devised for preventing this waste.

The Harris Smokeless Furnace Co. of Nashville, Tenn. seems to have solved the problem to the satisfaction of all concerned. They have invented and are manufacturing a furnace designed for use with any type of externally-fired boiler, carrying high pressure for power purposes. This furnace, by the principles of its construction, provides such perfect combustion that there is no smoke even from the most objectionable coals. This is provided by the burning of a mixture of air and producer or water gas, the latter being obtained by superheating the steam to dissociation and passing the dissociated oxygen and hydrogen in fine jets into the products of combustion arising from the burning fuel in the fire box, the air being highly heated before entering the fire box and reaching the producer gas. This result is obtained by the peculiar construction of the fire box, and not by the means commonly used, that is, by the use of a steam jet, which is very uneconomical of fuel.

A test was recently made of an installation of the smokeless furnace at the plant of the Howe Ice Co. of Nashville. This test was run under the direction of disinterested engineers, a careful analysis being made of the coals used with observations made to determine if the furnace were really "smokeless."

The condition of the stack was watched closely, and when any smoke was produced the time taken for the stack to clear after the firing was finished, was noted. On test No. 1 there were 76 smoke observations taken, or one at every firing. Sixty of these showed 5 per cent smoke (black smoke being 100 per cent and clear stack 0 per cent), and 16 showed 10 per cent. The average time of clearing of stack was 30 seconds. During test No. 2 there were 65 observations made. Twenty-one showed 5 per cent, 20 were 10 per cent, 2 were 20 per cent, 1 was 30 per cent, and 21 were 40 per cent. The stack smoked considerably until the method of firing was changed from throwing the coal well back into the furnace to pushing the live coals, which were in the front of the furnace, back against the bridge wall and firing the fresh coal in front. All of the 5 per cent smoke occurred after this method of firing was begun. The average time of clearing of stack on this test was one and one-half minutes.

The furnaces have been used in a number of concerns for terms varying from one to two years, so that they are by no means an experiment.

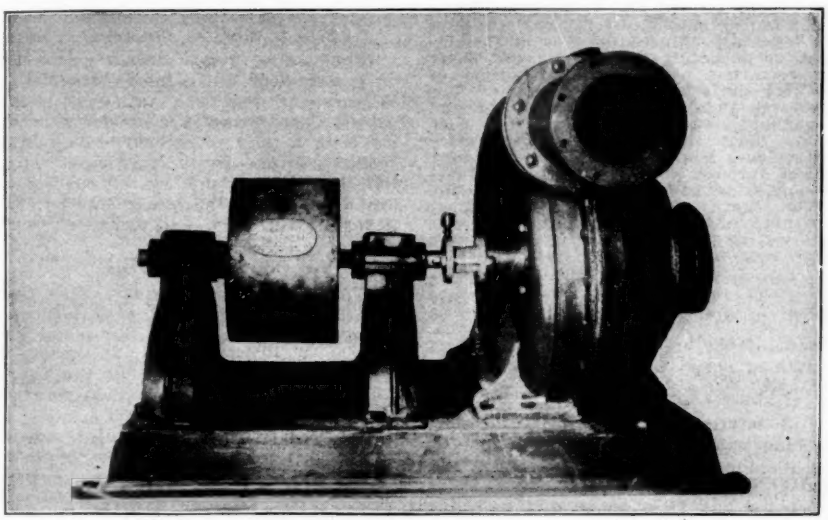
Their initial cost is one-third to one-half that of stokers; cost of maintenance fully 75 per cent less, with less smoke and more economy than any device made for the purpose.

The Harris Company is contemplating the manufacture of a smokeless garbage incinerator which should prove very popular with cities which are obliged through necessity to have their disposal plants within the corporate limits.

An All-Purpose Centrifugal Pump.

The Jesse Craft centrifugal pump shown in the accompanying photograph is the result of more than 40 years' experience in actual work, and today embodies features of market value. Built on scientific principles, they are durable, easily managed and not liable to get out of order; they will pass foreign material and water in greater quantities, with less wear to working parts, and require little power to operate, and, moreover, they are cheap in first cost.

This pump is of particularly durable construction, the wings being of high-grade steel, and are concave and convex in section so as to cause a direct movement of the water. The wings are entirely separate and interchangeable. The



THE JESSE CRAFT CENTRIFUGAL PUMP.

disc is of the balanced type, relieving the shaft of end thrust.

The pumps for drainage work are put out in sizes varying from a capacity of 200 gallons per minute to 5,000 gallons per minute. The largest size requires only 1.60 h. p. for each foot of elevation, while the smaller sizes require a very small amount of power, less in fact than their proportionate discharge.

The pumps will handle almost any kind of liquid or semi-liquid, cases having been recorded in which stones as large as 10 inches by 5 inches have been lifted a distance of thirty feet. The smaller sized pump requires from 375 revolutions for a lift of 4 feet to 1,200 revolutions for a 50 foot lift. The larger sizes require a proportionately fewer number of revolutions; the largest, in fact, requiring only 320 revolutions for a 50 foot lift.

More complete information may be had upon application to the Greaves Specialty Co., 154 Nassau street, New York, N. Y.

An Interesting Test of a Sewer Cleaner.

On Dec. 7 at Kansas City, Mo., was held a test of the new Sieben sewer cleaner, which demonstrated in a very satisfactory manner the efficiency of the apparatus.

The machine consists of a nozzle supported on runners which discharges through a small turbine water motor, causing one or two sets of hook-shaped blades to revolve rapidly. In so doing they stir up the dirt and sediment in the sewer to a thin grout, which the waste water from the turbine carries out. The machine is drawn slowly through the sewer by means of cables operated by windlasses. Four men are necessary to operate this machine, two on the windlass running the machine through the sewer, and two feeding in hose at the manhole.

In the event that the sewer is entirely clogged, making it impossible to pass a cable through the pipe, a special forcing jack with a number of coupling rods is provided, making it possible to force the machine through the sewer, first allowing it to run for a time in order to soften the obstruction. With a water pressure of only 60 pounds, the machine generates three horse power at the turbine, so that the blades will cut through weeds or tree roots that may be responsible for the clogging. A cartridge of chemical preparation may be inserted within the machine so that the water flowing through it may be made to dis-

infect as well as clean and scrub the sewer.

With reference to the recent test of the machine. Theodore Naish, engineer, who had charge of the work, reported as follows:

The Sieben machine was to clean the sewer from manhole No. 1 to No. 2. The average depth of sediment in this sewer was about 12 inches.

At 12:30 p. m. the Sieben crew, consisting of four laborers, one foreman and one team began the work of stringing hose to the nearest fire plug, 1,250 feet distant, and getting rods through the stretch of sewer between No. 1 and No. 2 preparatory to running the machine through. All preparatory work was done, water turned on and the machine started from manhole No. 2 at 3 p. m. A few minutes after the machine was started a length of hose burst, which caused a delay of 12 minutes while a new length was being put in. The machine was taken out at manhole No. 1 at 3:42, having traversed 371 feet of pipe in 42 minutes, or deducting the 12 minutes' delay for repairing hose, the actual time of cleaning the sewer was 30 minutes. The hose was then taken up and rolled and everything cleaned and put away by 5:30 p. m. That this sewer was actually cleaned was shown by running a Shannon bucket through the sewer after the Sieben machine had gone through. In the whole length of the sewer only about one-third of a cubic foot of dirt was gathered in the bucket. The cost of the work was as follows:

Foreman 5 hrs. at 37½c	$1.85
Team, 5 hrs. at 50c	2.50
Labor, 20 hrs. at 25c	5.00
Total labor cost	$9.35

Length of sewer cleaned 371 feet.
Cost per foot of sewer by Sieben machine, 2.52 cents.

Full information and prices on the machine will be furnished upon application to the Sieben Co., Eighteenth and Central streets, Kansas City, Mo.

Dedication of Indianapolis City Hall.

On December 21 the Indianapolis new city hall was dedicated with appropriate ceremonies. The dedicatory program was given in the afternoon, being opened by a brief address by Mayor Samuel Lewis Shank, head of the present administration. Speakers of the afternoon were former Mayors John L. McMaster, Thomas L. Sullivan, John W. Holtzman, Caleb S. Denny and Charles A. Bookwalter. Former Mayors Daniel W. Grubbs and Thomas Taggart were not present.

The new city hall was erected at a cost of $669,239.83. The building is of Bedford stone and is a modern adaptation of the classic Greek Ionic. It consists of four stories and covers an area of 188x133 feet. Floors of all lobbies and corridors are of marble and in the corridors the wainscoating and pillars are in marble. All offices are provided with hardwood floors and an interior wood finish of mahogany. Rubush & Hunter were the architects and the Westlake Construction Co., of St. Louis, were the contractors.

When the city hall building first was proposed by former Mayor Charles A. Bookwalter, the City Council voted a bond issue which amounted to $600,425. Other money since has been appropriated, the most of which was transferred from the old coliseum fund to the city hall fund, making the total cost to date.

All of the city offices except the police department will be housed in the new city hall. This will include the mayor's office, the board of public works, the city engineer, the assessment bureau, the board of public safety, the legal department, the city controller, board of health, the city clerk, the superintendent of streets, the building inspector and the board of park commissioners.

A Book on Concrete.

"Confidential Trade Notes" is the title of a new book by Amos Strouffer of Waynesboro, Pa. The author is a man of wide experience in concrete work and his book is said to embody the practical results of his work. Particular attention is given to the use of concrete in ornamental work such as interior finishing, lawn, park and cemetery work.

Trade Publications.

"The Wadsworth Macadam, The Coming Roadway," is the title of a booklet issued by the Wadsworth Stone and Paving Co. of Pittsburg, Pa. It consists of a number of views showing the use of Kentucky rock asphalt in road construction and the resultant road.

The Rochester Chamber of Commerce in an effort to secure the next convention of the American Road Builders Association for that city, distributed at the Indianapolis session a booklet of views and statistics of the city of Rochester which is very creditable in every particular.

The December issue of the publication of the Lehigh Portland Cement Co. contains a description with illustrations of the new Asylum avenue viaduct in Knoxville, Tenn. Other photographs showing the Galveston sea wall, and several pieces of private construction are given.

The Association of Creosoted Wood Paving Manufacturers of Chicago have a very well executed book of views and descriptive matter relative to the use of wood in pavements. The photographs shown are collected from cities in Europe as well as in the United States.

The Amies Road Company of Philadelphia have a book of descriptive matter and photographs showing the use of "Amiesite" in road construction and the roads built with this product. They also have a set of specifications of value to one interested in road work.

The Knox Automobile Co. of Springfield, Mass., have an illustrated catalogue of motor vehicles for commercial use, and

among them are some excellent examples of modern fire fighting machines.

The general catalogue of "Peerless" machinery, made by the Geiser Manufacturing Co. of Waynesboro, Pa., contains descriptions of a very complete line of road rollers and traction engines.

The monthly Edison Portland Cement Co. "Aggregate" is devoted to stucco and concrete residences. Some very attractive examples of construction are shown.

The James Boyd and Brothers Company of Philadelphia, have a handsomely illustrated catalogue of fire apparatus. A number of modern motor equipments are shown.

The monthly booklet of the Universal Portland Cement Co. contains among other topics of interest, a description of a concrete warehouse in Minneapolis, of "mushroom" construction; a concrete dock on the Chicago river; a concrete cube pavement; and the railroad rules on returned cement sacks.

Richard Dudgeon, 24 Columbia street, New York, N. Y., has a very complete catalogue and price list of hydraulic jacks and pressure pumps.

"The Latest Word on an Old Subject" is a booklet descriptive of the use of "Glutrin" in road building and maintenance. It is issued by the Robinson Process Co. of Sable Forks, N. Y.

The American Paving and Manufacturing Co., of Indianapolis, have a small book and a set of specifications regarding the use of Bitu-Mass in road work.

The Milwaukee Concrete Mixer and Machinery Co. have a booklet giving illustrations and data regarding their concrete mixer.

Reinforced metal of all kinds is described in an illustrated booklet of the William B. Hough Co., Chicago, Ill.

The Crawfordsville Corrugated Culvert Co. of Crawfordsville, Ind., have a leaflet and price list of their product.

The Yellow Pine Manufacturers' Association of St. Louis, have a booklet of data and facts on wood block pavements.

The Goit Manufacturing Company of Oklahoma City, Okla., have a leaflet descriptive of their patent dump wagons, cars and carts.

The Quenner Crusher is the title of a booklet issued by the Quenner Dry Crusher Co., Singer Building, New York City.

Among the pamphlets and publications distributed by the National Paving Brick Manufacturers' Association are Directions for Laying Vitrified Brick Street Pavements; An Object Lesson in Street Pavements; Good Roads at the Home of Indiana University; The Proper Conctruction of Brick Streets; The Indianapolis Motor Speedway; and The Permanent Roadways.

The International Harvester Co. of Chicago, Ill., has recently issued a new departure in almanacs. The feature articles in the new almanac are by Frank P. Holland, President Texas Farm and Ranch Pub. Co., who writes on "Trees Worth Growing;" Prof. P. G. Holden, of the Iowa College of Agriculture, who writes on "Corn;" W. D. Hoard, editor of Hoard's Dairyman, who tells about "Up-to-date Dairying;" and Henry Wallace, editor of Wallace's Farmer, who advises on "Sanitation in the Country;" "Building Suggestions" by J. E. Wing; "Farm Power" by Prof. E. C. Lucke of Columbia University; "Farm Machines and Progress," together with maps showing the number of machines in use and the production of wheat by decades from 1840 to 1900.

Trade Notes.

ASPHALT.

St. Louis, Mo.—Bids will be received on Jan. 10, 12 m., for the construction and installation of a municipal asphalt plant. Deposit of $725 required. Board of Public Improvements, rm. 399, new city hall, St. Louis, Mo.

CEMENT.

Houston, Tex. — Special. — A contract for the construction of two concrete oil storage reservoirs in California of 1,000,000 barrels capacity each, was awarded to Weber-Duller Company of Houston, Tex. They will be 600 feet in diameter and 20 feet high.

Los Angeles, Cal.—Plans are being prepared for a reinforced concrete tank 80 ft. diameter by 11 ft. high and will have a capacity of 415,000 gallons.

Indianapolis, Ind.—Prices and catalogues are requested for machinery for the manufacture of cement blocks and concrete construction. John C. Treetor, Spruce st., Indianapolis, Ind.

Richmond, Va.—The contract for furnishing 6,000 bbls. of Old Dominion Portland cement was awarded to C. P. Lathrop, Richmond, Va.

MACHINERY AND SUPPLIES.

Minneapolis, Minn.—Bids will be deceived until Jan. 13, 7:30 p. m., for furnishing paving material and cement for sewer construction for the year of 1911. Certified check required. Henry N. Knott, cy. clk.

Point Gray, B. C.—Bids will be received until Jan. 11 for furnishing about 35 miles of 6 to 24-in. steel pipes and special castings for water supply. Cleveland & Cameron, 506 Winch Bldg., Vancouver, B. C.

MISCELLANEOUS.

Tucson, Ariz.—Preparations are being made for the erection of a rock crusher to prepare crushed rock material for road work in anticipation of a great quantity of road work that will be done in the valley within the next few years.

Mattoon, Ill.—Special.—The H. W. Clark Co., manufacturers of the Clark meter box and water works appliances, contemplate the building of a new enlarged and modern factory, comprising both iron and brass machine shop and concrete works. The rapidly continuous increase of this company's business has made this move necessary. We are not informed as to whether they will build in Mattoon or elsewhere.

Indianapolis, Ind.—Special.—Mr. C. M. Brown, 321 Board of Trade Building, Indianapolis, Ind., has been put in charge of an agency for the Harris Smokeless Furnace Co. of Nashville, Tenn.

Louisville, Ky.—Thomas L. Barret has established an agency for contractors' supplies and equipment in Louisville. Everything from concrete mixers to nails is handled.

New York.—The Ingersoll-Rand Company has acquired a controlling interest in the stock of the A. S. Cameron Steam Pump Works, whose plant is located at the foot of East Twenty-third street, New York. George Doubleday is president.

Columbus, O.—Special.—The Jeffrey Manufacturing Company, who manufacture elevating, conveying and moving machinery, have opened a new office in the Fourth National Bank Building, Atlanta, Ga., with Mr. D. C. Rose, formerly with the Dodge Mfg. Co., as manager. A stock of Jeffrey chains and catalogs will be on hand.

Philadelphia, Pa.—Special.—The Lathbury-D'Olier Company, engineers, announce a merger of the interests of B. B. Lathbury, consulting engineer, (formerly president of Lathbury & Spackman, Inc.,) and of the D'Olier Engineering Company. The company will continue the general and special engineering, manufacturing and contracting business, heretofore carried on by the respective interests. Their main offices are in the Morris Building, Philadelphia, with a branch office in New York.

Seattle, Wash.—An ordinance was passed authorizing the board of public works to purchase an auto spring wagon fo rthe city electrician.

Racine, Wis.—Special.—The addition to the boiler shops of the J. I. Case Threshing Machine Co., Inc., Racine, Wis., is just being completed. This is a building 60 ft. by 215 ft., which will be used exclusively for a stock room for the Case boiler shops. A boiler storage has been completed 230 ft. by 60 ft. This is equipped with a traveling train for movement of boilers from one part of the building to another.

IMPROVEMENT AND CONTRACTING NEWS

PAVING.

CONTEMPLATED WORK.

Wetumpka, Ala.—Voted $70,000 bonds for good roads in Elmore co.

Tucson, Ariz.—Preparations are being made for the erection of a rock crusher to prepare crushed rock material for road work in anticipation of a great quantity of road work that will be done in the valley within the next few years.

Azusa, Cal.—Voted $40,000 bonds for road improvements.

Los Angeles, Cal.—Voted $100,000 bonds for completion of paved highway to Long Beach from the business district of Los Angeles.

Long Beach, Cal.—The paving of Pine and 3rd sts. is contemplated.

Riverside, Cal.—Plans are being prepared for the paving of portions of Denton and Center sts. and Prospect ave. Cost about $85,000.

Placerville, Cal.—The construction of a road between Folsom and Placerville to connect Sacramento co. road with the state road to Lake Tahoe is contemplated.

Pomona, Cal.—Bids will soon be asked for paving 2nd st. T. R. Trotter, city clerk, Pomona, Cal.

San Francisco, Cal.—Voted $18,000 bonds for state highway improvements.

Sausalito, Cal.—Arrangements are being made for expenditure of $50,000 on the improvement of various streets, using a system of road building known as oilcrete. The foundation of the roadbed will be built of concrete 4 ins. deep and reinforced in the center with wire netting; on top of this will be placed a composition of 90 per cent asphalt.

St. Augustine, Fla.—The city will spend about $30,000 for street improvements.

Rome, Ga.—Voted $50,000 bonds for paving various streets.

Springfield, Ill.—The paving of Edwards st. from 9th to 21st sts.; Jackson st. from 6th to 11th sts. and Candey st. from Walnut to alley between 5th and 6th sts. is contemplated.

Huntington, Ind.—The paving of Cherry st. is contemplated.

Indianapolis, Ind.—The contract will be let soon for laying cement walks on Capitol ave.

Carroll, Ia.—The paving of 5th and other streets is contemplated.

Council Bluffs, Ia.—The paving of Broadway is contemplated.

Mason City, Ia.—The paving with cement of 9,000 lin. ft. of sts. is contemplated.

Iola, Kan.—Plans are being prepared for a macadm highway extending south to Tulsa and north to Kansas City.

Wichita, Kan.—The paving of W. 8th st. is contemplated.

Bloomington, Ill.—About 30,000 sq. yd. of brick pavement and about 5,000 sq. yd. asphalt on concrete foundation will be laid next year.

Crookston, Minn.—Paving Houston ave. and three other sts. with Westrumite is contemplated.

Duluth, Minn.—The construction of an automobile road to Port Arthur, Ont., Can., is contemplated.

Hazlehurst, Miss.—Voted $50,000 bonds for road improvements.

St. Joseph, Mo.—Resurfacing of the brick paving on 8th st., Olive to Messanie st. and Messanie st., 8th to 6th with asphalt is contemplated.

Raton, N. M.—An expenditure of $60,000 for street improvements is contemplated.

Brooklyn, N. Y.—The following street improvements are contemplated: Paving with asphalt E. 26th st. from Clarendon rd. to ave. D, proposed contract time 20 days, estimated cost, $4,000; paving with asphalt block 56th st. from 6th ave. to

7th ave., proposed contract time, 20 days, estimated cost $5,300; paving with asphalt E. 2nd st. from Ditmas ave. to a point about 160 ft. north of ave. F, proposed contract time 20 days, estimated cost, $4,100; paving with asphalt E. 28th st. from Foster ave. to Flatbush ave., proposed contract time 25 days, estimated cost $7,000; paving with asphalt E. 31st st. from Church ave. to Snyder ave., proposed contract time 20 days, estimated cost, $3,700; regulating and grading 10th ave. from Fort Hamilton ave. to 61st st., and from 62nd st. to 69th st., estimated cost $10,000, assessed valuation $300,000; regulating, grading and paving with asphalt 52nd st. from 13th ave. to 16th ave., estimated cost $18,800, assessed valuation $175,000; regulating and grading Howard ave. from E. New York ave. to E. 98th st., estimated cost, $22,000, assessed valuation $83,500; paving with asphalt W. 23rd st. between Surf ave. and a line about 530 ft. southerly therefrom, estimated cost, $4,900, assessed valuation $182,800; paving with asphalt Gravesend ave. from ave. C to Foster ave., omitting space occupied by Prospect Park and Coney Island railroad, estimated cost $38,400, assessed valuation $518,000; paving with asphalt 67th st. from 2nd ave. to 3rd ave., estimated cost $6,100, assessed valuation $41,100; repaving with asphalt and curbing and recurbing E. New York ave. from Pitkin ave. to Douglass st., estimated cost $7,800, assessed valuation $48,000.

Canton, O.—Plans are being prepared by the city engr. for about 5 mi. of brick block paving on concrete foundation to be constructed during the coming year.

Canton, O.—The construction of 8 mi. of permanent highway improvements in Stark Co. is contemplated for the coming year.

Jefferson, O.—The construction of the Jefferson-Colebrook macadam road is contemplated.

Oklahoma City, Okla.—Voted $500,000 bonds for highway construction.

Portland, Ore.—A macadam pike from the Columbia river to Oregon's southern boundary line is planned. This will mean about 300 miles at an estimated cost of $5,000 a mile. The paving of E. Waters st. with stone blocks is contemplated.

Bellevue, Pa.—Paving Lincoln ave. and Brighton and West Bellevue roads is contemplated.

Mitchell, S. D.—The paving of Main st. is contemplated.

Jonesville, Tenn.—Voted $300,000 bonds for road improvements.

Memphis, Tenn.—The paving of Madison ave. with creosote wood blocks is contemplated.

Temple, Tex.—Bids will soon be requested for paving N. Main st. and W. French ave. with durable material.

Jonesville, Lee Co., Va.—Voted $300,000 bonds for construction of good roads.

North Yakima, Wash.—Plans have been prepared for paving various streets to cost about $125,000 and the paving of Yakima, Miles and 7th aves. is contemplated.

Seattle, Wash.—Plans will shortly be prepared for the construction of the Hugo Kuhnhausen road, about 2 miles long.

Seattle, Wash.—Sidewalks on N. 82nd and 80th sts. and various others are contemplated.

Spokane, Wash.—Plans have been prepared for grading, curbing, sidewalking and paving, with ollerold, 7th ave., cost about $10,300; grading, curbing and sidewalking 16th ave., cost about $6,750; Stevens st. estimated cost $4,750; also for removing parking strip in roadway and paving same with asphalt on Riverside ave. between Monroe and Cedar sts. and Cedar st. between 1st and 2nd aves., estimated cost $9,490; and the grading, curbing and sidewalking of Lacey st. is contemplated.

Toppenish, Wash.—The paving of seven blocks of streets is contemplated.

Walla Walla, Wash.—Plans have been prepared for the construction of the McDonald road, estimated cost $25,000.

Wenatchee, Wash.—The construction of a 40-mile road to cost about $200,000 is contemplated.

Milwaukee, Wis.—About $100,000 will be expended for good roads.

CONTRACTS TO BE LET.

Los Angeles, Cal.—Bids will be received until Jan. 16 for improving portions of Huntington drive. C. G. Keyes, co. clk.

St. Petersburg, Fla.—Bids will be received Jan. 5 for about 4,000 lin. ft. of brick paving with granite curb. W. F. Devine, cy. clk.

East St. Louis, Ill.—Bids will be received until Jan. 5 for grading, curbing and paving with brick, 1620 sq. yds. on Linden ave. and 8305 sq. yds. on 40th st. Frank B. Hanna, clk. bd. of local impvt.

Beech Grove, Ind.—Bids will be received until Jan. 3 for constructing a highway including a parkway from 11th ave. in Beech Grove to city limits of Indianapolis. E. C. Martin, town clk.

Madison, Ind.—Bids will be received on Jan. 3, 1 p. m. for the construction of road in Madison tp. Gaylor F. Crozier, audt.

Martinsville, Ind.—Bids will be received on Jan. 3, 2 p. m. for highway improvements in Adams tp. B. E. Thornburgh, audt.

Vincennes, Ind.—Bids will be received on Jan. 3 for the construction of the following gravel roads: Emisen Laten, James Williams. John T. Scott, audt., Vincennes, Ind.

Washington, Ind.—Bids will be received on Jan. 3 for the construction of 2 gravel roads in Barr tp. Thomas Nuget, audt.

Hutchinson, Kan.—Bids will be received until Jan. 6 for improving 6 miles of Haston road. A. R. Hamma, audt.

Oskaloosa, Kan.—Bids will be received until Jan. 9 for grading and macadamizing a portion of James Neal road. Geo. A. Patterson, chmn. co. com.

Paducah, Ky.—Bids will be received on Jan. 16, 3:30 p. m. for improvement of the following streets: Broadway from the I. C. R. R. to 15th st., including 14,325 sq. ft. concrete sidewalks, 820 sq. ft. of concrete driveway, 2,900 lin. ft. concrete gutters, 2,900 lin. ft. granite curbing; Jefferson st. from 11th to 14th sts., including 23,000 sq. ft. concrete sidewalks, 800 sq. ft. concrete driveways, 3,940 lin. ft. concrete gutters, 3,940 lin. ft. granite curbing, 200 lin. ft. of cast iron drain pipe; N. 10th st., from Trimble st. to Burnett st., including 13,300 sq. ft. concrete sidewalks, 380 sq. ft. concrete driveways, 2,520 lin. ft. concrete gutters, 2,500 lin. ft. granite curbing. 500 lin. ft. of cast iron drain pipe. Board of Public Works, Paducah, Ky.

St. Louis, Mo.—Bids will be received on Jan. 10 for constructing a municipal asphalt plant. W. B. Dryden, secy., Board of Public Improvements.

Sedalia, Mo.—Bids will be received until Jan. 2 for paving with brick 10,000 yds. on Prospect ave. C. E. Baker, cy. clk.

Salem, N. J.—Bids will be received un-

til Jan. 11 for grading and placing gravel and oyster shell surface on the Mannington, Pilegrove and Woodstown road, 5.05 miles. Bd. of ch. freehldrs.

Albany, N. Y.—Bids will be received until Jan. 9, 11 and 13 for improving highways. S. Percy Hooker, chmn. highway com.

Brooklyn, N. Y.—Bids will be received until Jan. 4 for paving with asphalt on portions of E. 2nd, E. 26th, E. 28th, E. 31st and 56th sts., with 5 years' maintenance guarantee. Alfred E. Steers, prest. borough Brooklyn, N. Y.

Cincinnati, O.—Bids will be received on Jan. 6 for improving Dick road in Crosby tp. Fred Dreihs, clk.

Circleville, O.—Bids will be received on Jan. 3 for paving Court st. with vitrified brick, including 6 in. concrete foundation, cement or asphalt filler, etc. John W. Lowe, Circleville, O.

Cleveland Heights, Cleveland, O.—Bids will be received on Jan. 3, 12 m., for improving Euclid Heights blvd. H. H. Canfield, village clk.

Salem, Ore.—Bids will be received until Jan. 16 for paving about 175,000 sq. yds. with hard surface pavement. W. A. Moses, cy. recdr.

Walla Walla, Wash.—Bids will be received until Jan. 18 for construction and macadamizing the McDonald state road in Walla Walla county. Highway bd. Olympia, Wash.

Beloit, Wis.—Bids will be received on Jan. 20 for paving various streets with brick, cement curb and gutter. Bert Woods, clk., Beloit, Wis.

CONTRACTS AWARDED.

Birmingham, Ala.—The contract for constructing 120,000 sq. yds. of bitulithic paving was awarded to Southern Bitulithic Co., Birmingham, Ala.

Fayette, Ala.—The contract for constructing 3 miles of cement sidewalks was awarded to James C. Lang Jr., 415 Empire Bldg., Birmingham, Ala.

Selma, Ala.—The contract for grading and graveling 32 miles of public road was awarded to Newell & Bradford, Brown-Marx Bldg., Birmingham, Ala.

Little Rock, Ark.—The contract for the construction of 10 miles of gravel road on the Sulphur Springs and Camden roads leading out of Pine Bluff was awarded to Woodmall & McCarthy, Little Rock, Ark., $42,980.

Glendale, Cal.—The contract for the improvement of Glendale and Tropico rds. and 6th st. and La Cadda-Verdiogo rd. was awarded to M. K. Peaseley, Wilcox Bldg., Los Angeles, Ca., $23,888.

Los Angeles, Cal.—The following contracts were awarded: Improving portion of Bellevue ave., to T. H. McGowan, Los Angeles, Cal., $5,283; paving Hoover st. with asphalt, to Fairchild-Gilmore Wilton Co., Pacific Electric Bldg., Los Angeles, Cal., $13,500.

Pasadena, Cal.—The contract for asphalt paving on Delacy st. between Union and Green sts. was awarded to Chas. A. Baldwin, Los Angeles, Cal.

Pomona, Cal.—The contract for paving portions of 2nd st., including culverts and manholes was awarded to Fairchild-Gilmore-Wilton Co., Pacific Electric Bldg., Los Angeles, Cal.

Riverside, Cal.—The contract for the improvement of Locust st. was awarded to Johnson-Shea Co., 5th and Market sts., Riverside, Cal., $11,998.

San Francisco, Cal.—The contract for paving Mission st. was awarded to A. J. Raisch, San Francisco, Cal., $50,000.

Waterbury, Conn.—The contract for the construction of 13,300 ft. of road was awarded to Jenks & Goepuie Co., Wilton, Conn., $14,900.

Jacksonville, Fla.—The contract for constructing 20 miles of road in Duval Co. was awarded to Engineering Paving Co., Jacksonville, Fla.

Dalton, Ga.—The contract for paving Hamilton, King and Crawford sts. was awarded to West Construction Co., Chattanooga, Tenn., $56,820.

Bloomfield, Ind.—The contract for the construction of macadam road was awarded to Samuel Hays, Wilmington, Ind., $5,010.

Crawfordsville, Ind.—The contract for the improvement of John B. Layne et al. stone road was awarded to Geo. B. Lynch, Darlington, Ind., $7,699.

Kokomo, Ind.—The contract for the construction of gravel road to Neis & Co., Frankfort, Ind., $4,027; construction of macadam road was awarded to W. F. Smith & Co., Rensselaer, Ind., $4,770.

Greencastle, Ind.—The contract for the construction of gravel road 13,957 ft. long in Jackson and Franklin tps. was awarded to A. G. Day, Greencastle, Ind., $6,500.

Lafayette, Ind.—The contract for macadamizing 4 miles of riverside road was awarded to W. F. Frey, Lafayette, Ind., $24,842.

Lebanon, Ind.—The contract for paving the roadway of N. Lebanon st. was awarded to Geo. T. Miller, Lebanon, Ind., $6,234.

Logansport, Ind.—The following contracts were awarded: Construction of roads in Cass Co. to Barnes & Grau, Logansport, Ind.; Walter Girton, Logansport, Ind.; James Pierce, Delhi, Ind.

Peru, Ind.—The contract for the construction of 2 gravel roads in Washington tp. was awarded to H. C. Modlin, & Co., Peru, Ind., $11,429.

Terre Haute, Ind.—The contract for the construction of the Roonce gravel road in Fayette tp. was awarded to Geo. Fuqua, Vermillion, Ill.

Wabash, Ind.—The contract for the construction of gravel road in Paw Paw tp. to Geo. Sewell, Laketon, Ind., $5,380; construction of gravel road in Noble tp. was awarded to A. F. Hipskind, Wabash, Ind., $18,230.

Williamsport, Ind.—The contract for the construction of gravel road in Jordan tp. was awarded to W. W. Crane, Hedrick, Ind., $5,000.

New Orleans, La.—The following contracts were awarded: Paving lake side of Claiborne st. to Barber Asphalt Co., 205 Chartres st., New Orleans, La.; paving Rendon st. to Standard Paving Co., Society for Savings Bldg., Cleveland, O., $13,004; paving Prytania st. from Robert to Joseph st. with wooden blocks and bitulithic was awarded to A. Black, New Orleans, La.; paving on river front from Thalia to Bienville st. with small granite blocks on concrete foundation was awarded to Grasser Contracting Co., New Orleans, La., $56,457.

New Orleans, La.—Paving of Soniat st., repaving 7th st. etc., to Standard Paving & Construction Co., $22,548; paving Jeanette st. to J. A. Cravenoff Co., $17,013; paving Erato st. to Southern Bitulithic Co., First Natl. Bank Bldg., Nashville, Tenn., $34,755.

Bezoni, Miss.—The contract for about 3 miles of concrete sidewalks was awarded to Delta Paving Co., Clarksdale, Miss.

Gulfport, Miss.—The contract for the construction of about 10,000 sq. yds. of cement sidewalk was awarded to J. B. Silver & Son, Alliance, O.

Lincoln, Neb.—The contract for paving

the following sts.: B st. from 7th to 11th, C st. from 19th to 27th; B st. from 19th to 20th st., 20th st. from A to D was awarded to Badger Asphalt Paving Co., Omaha, Neb., $50,626.

South Omaha, Neb.—The following contracts were awarded: Paving of alleys to Jas. Park, others to National Construction Co., South Omaha, Neb.

Las Cruces, N. M.—The contract for paving Main st. with asphalt was awarded to O. H. Brown, Las Cruces, N. M.

Newark, N. J.—The contract for grading, curbing and flagging Carlisle and Clay sts. was awarded to Van Kueren & Son, Newark, N. J.

Albany, N. Y.—The contract for paving Jeanette st. was awarded to Muldarry Bros., 115 1st st., $8,145.

Buffalo, N. Y.—The contract for paving Rano st. Riverside ave. to north end of street with standard asphalt was awarded to German Rock Asphalt Co., Morgan Bldg., Buffalo, N. Y.

New York, N. Y.—The contract for furnishing and delivering wool paving blocks to 3rd ave., 145th st., was awarded to U. S. Wood Preserving Co., 165 Broadway, New York, N. Y.

Syracuse, N. Y.—The contract for paving Concord place was awarded to John Young, Syracuse, N. Y., $6,508.

Syracuse, N. Y.—The contract for paving a portion of Catherine st. was awarded to T. J. Baker, University blk., Syracuse, N. Y., $20,590.

Cincinnati, O.—The contract for the improvement of Hill road near the residence of Jacob Stephan, in Colerain tp. was awarded to N. Ruebel, Bridgetown, O., $1,840.

Cincinnati, O.—The following contracts were awarded: Paving with brick block Herschel ave. from Observatory rd. to the old corporation line to Morgan & Springmeier, Cincinnati, O., $7,257; and for paving Plum st. from Court to S. Canal st. with granite, to J. M. Quill, Cincinnati, O., $5,618; improvement of North Bend rd. from Harrison pike to north corporation line of village of Cheviot in Green tp. was awarded to R. E. Cash, 115 Ehrman ave., Cincinnati, O., $11,177; macadamizing Sutter ave. between Beekman and Linden sts. was awarded to County Construction Co., 409 Schofield Bldg., Cleveland, O., $5,545; paving Rutland ave. between Montgomery rd. and Trimble ave. was awarded to Patrick Gleason, 1906 Highland ave., Cincinnati, O., $7,422.

Columbus, O.—The contract for paving High st. from 5th ave. to Doderidge st. with asphalt, Harris block gutters and asphalt filter was awarded to Andrews Asphalt Paving Co., Hamilton, O., $74,-154; the contract for improving a portion of W. High st. was awarded to Andrews Asphalt Paving Co., Hamilton, O., $74,000.

Linden Heights, O.—The contract for the construction of about 190,000 sq. ft. of flagstone sidewalks was awarded to R. Deckard & Son, Bowling Green, O.

Lisbon, O.—The contract for furnishing the labor and material necessary to grade the East Liverpool and Lisbon rd. was awarded to W. D. Hammond, Jacobsburg, O.

Toledo, O.—The contract for improving Ragan rd. in Maumee was awarded to Garrigan Bros., Valentine Bldg., Toledo, O., $22,000.

Pawhuska, Okla.—The contract for paving various sts. cement base, vitrified brick and asphalt filler was awarded to Howard Walton, Copperville, Okla. and E. A. Hanna, Ochelata, Okla.

Portland, Ore.—The contract for paving street surrounding Ladd Park about 3 blocks on E. 33rd and 39th sts., 6 blocks on E. Ankeny and Oak sts. and 2 blocks on E. Ash st. was awarded to Barber Asphalt Co., Portland, Ore.

Portland, Ore.—The following contracts were awarded: Paving E. 40th st., E. Glisan st., Kerby st. and Klickitat st. to Oregon Hassam Paving Co., Board of Trade Bldg., $30,032; paving Constance st., grade and concrete walks on Princeton st., grades and walks on E. Lincoln st., Spokane ave., grade Claybourne st., grades and walks on E. 13th to Giebisch & Joplin, Portland, Ore., $23,600; asphalt pavement on E. Market st. to Barber Asphalt Paving Co., Worcester Bldg., $4,-404; bitulithic pavement on Parkside drive to Warren Construction Co., Portland, Ore., $5,489.

Harrisburg, Pa.—The following contracts were awarded: Paving 19,330 sq. yd. and 16,135 ft. of curbing to Central Construction Co., Commonwealth Bldg., Harrisburg, Pa., $40,012; paving 58,922 sq. yd. and 14,685 ft. of curbing to Barber Asphalt Co., Harrisburg, Pa., $121,-822.

Pittsburg, Pa.—The contract for paving Ardmore blvd. was awarded to Booth & Flynn, 1942 Forbes, Pittsburg, Pa.

Wilkes Barre, Pa.—The contract for paving Stetson and Empire sts. was awarded to John E. James, Wilkes Barre.

Providence, R. I.—The following contracts were awarded: Furnishing 100,000 granite paving blocks to Cato Granite Co., Westerly, R. I.; 200,000 granite paving blocks to Hurricane Isle Granite Co., N. Y.

Amarillo, Tex.—The contract for paving with vitrified brick was awarded to Ocklander Bros., Dallas, Tex.

Austin, Tex.—The contract for laying 41,500 sq. ft. of sidewalks was awarded to J. Brueggermann, Austin, Tex.

Dallas, Tex.—The contract for paving Grand ave. and Holmes st. with bitulithic was awarded to Texas Bitulithic Co., Dallas, Tex.; the contract for paving portion of Main st. with bitulithic was awarded to Texas Bitulithic Co., Western Bank and Trust Bldg., Dallas, Tex., $30,-000.

Fairfield, Tex.—The contract for constructing 35 mi. of clay and sand roads was awarded to C. E. Johnson, Houston, Tex., $50,000.

Galveston, Tex.—The contract for paving Tremont st. between ave. P½ and the North line of the county boulevard was awarded to Kelso & Vautrin, Galveston, Tex.

Norfolk, Va.—The contract for grading the new road to be built from Tanner's creek across roads through the lands of J. D. Guy and others was awarded to Southern States Engineering & Equipment Co., Norfolk, Va.

Portsmouth, Va.—The contract for the construction of about 80,000 sq. yds. of street paving next spring was awarded to Barber Asphalt Co., Philadelphia, Pa.

Aberdeen, Wash.—The contract for paving Broadway from Wish Kah st. to First st. was awarded to Barber Asphalt Paving Co., Tacoma, Wash.

North Yakima, Wash.—The following contracts were awarded: Grading on Walnut ave. et al. to West Coast Construction Co., Madison Bldg., North Yakima, Wash., $32,528; the contract for grading E. 47th st. was awarded to A. Peterson, Pioneer Bldg., North Yakima, Wash., $13,651; the contract for grading 32nd st. et al. was awarded to J. L. Stanley, 604 Fairview ave., North Yakima, Wash.;

the contract for grading 31st st. was awarded to J. A. Zinkham, 1324 Howard ave., North Yakima, Wash., $3,041; the contract for paving 4th ave. and others was awarded to Allain & Hull, Alaska Bldg., North Yakima, Wash., $2,831.

Seattle, Wash.—The following contracts were awarded: Paving 14,330 sq. yds. with brick to Barber Asphalt Paving Co., Seattle, Wash.; the contract for paving 4th ave. and others was awarded to Barber Asphalt Paving Co., Seattle, Wash., $72,661; the contract for grading and paving Crawford Place was awarded to S. Norwich, Seattle, Wash.; the contract for grading in McNaughts 3rd add. was awarded to Lewis & Wiley, Central B'dg.

Tacoma, Wash.—The following contracts were awarded: Sidewalks in district No. 773 to Smith Cement Brick Co., 772 Commerce st., Tacoma, Wash., $6-595; grading and sidewalks to Pacific Fuel Co., 1950 South C st., Tacoma, Wash., $1,629.

Berlin, Ont.—The contract for paving various streets was awarded to Warren Bitulithic Co., Boston, Mass., between $80,000 and $100,000.

New Westminster, B. C.—The contract for paving 3rd st. was awarded to Hassam Paving Co., Vancouver, B. C., $44,-760.

SEWERS.

CONTEMPLATED WORK.

Anaheim, Cal.—Plans and estimates are being prepared for a sewer system.

Bakersfield, Cal.—The installation of sewers in I st. and Truston ave. is contemplated.

Corning, Cal.—Sewer and water works systems to cost about $68,800 is contemplated.

Colusa, Cal.—The city engineer is preparing plans for water works and sewer system.

Hanford, Cal.—Plans have been adopted for extensions to the sewer system. Cost about $63,000.

Long Beach, Cal.—Installation of sewers in 2nd, 3rd, 4th, 5th, 6th and 7th sts., Alamitos and O'ive aves. and various alleys is contemplated.

Colorado Springs, Co'.—Plans have been completed for storm sewers from Platter ave. to Costilla st. and from Cascade ave. to Shoaks Run. Cost about $40,448.

Rome, Ga.—Voted $50,000 for construction of various sewers.

Bloomington, Ill.—Plans are being prepared for 1,000 ft. brick sewer.

Chicago, Ill.—The board of local improvements have ordered the construction of sewers in the following streets: Albany ave. from 9 to 4 ft. in size; Rockwell st. from 10 ft. to 4½ in. in size. Estimated cost $810,000.

Galesburg, Ill.—Construction of trunk sewer is contemplated.

Vinton, Ia.—The city council is considering the laying of a sanitary sewer, and it is expected that work will be started the first thing in the spring.

Dawson Springs, Ky.—Plans are being prepared for 1½ miles of new sewers to cost about $10,000.

Easton, Md.—The construction of various sewers and sewage disposal plant is contemplated.

Bessemer, Mich.—Voted $15,000 bonds for sewers.

Kalamazoo, Mich.—Bids will soon be requested for construction of sewer in Fulford st., estimated cost $15,000.

Duluth, Minn.—Plans are being prepared for laying a sewer from Woodlawn Co. line to Fischers creek. Estimated cost $71,000.

Black Mountain, N. C.—Construction of sewer system to cost about $12,000 is contemplated.

Delaware, O.—Plans are being prepared for a sewage disposal plant.

Duncan, Okla.—Will vote bonds in January to the amount of $45,000 for the construction of a system of sanitary sewers, and for the extension of the present water works system. Two deep wells are at present in the course of construction, and a good supply of water is assured. Later the proposition of paving the business district of the city will be taken up by the board of commissioners. W. L. Benham, cons. engr., 714-16 Campbell Bldg., Oklahoma City, Okla.

Portland, Ore.—Plans are being prepared for sewers in the following streets: Market, E. Salmon, E. Water and E. 3rd.

Corpus Christi, Tex.—Plans are being prepared for a sewer system to cost about $140,000.

Dallas, Tex.—It has been decided to construct a sewer between Houston and Texas Central Ry., Ervey st., Live Oak st., and Ross ave. Cost about $20,000.

Houston, Tex.—Plans are being prepared for a storm water lateral along McGovern ave. from Main st. to a connection with the big Austin st. sewer.

Virginia Beach, Va.—Bids will soon be asked for construction of various sewers.

Chehalis, Wash.—Sewers will be constructed next spring to cost about $56,000.

Seattle, Wash.—Sewers in Meridian ave. and various others are contemplated.

Spokane, Wash.—Plans are being prepared for a sanitary and storm concrete sewer for the Union Park district to cost about $300,000.

Tacoma, Wash.—The laying of a 15-in. sewer in Miller's third acre-tract plat and Miller's acre tracts from S. 66th st. to S. 72nd sts. on S. 66th st. and others and S. 61st st. is contemplated.

Vancouver, B. C.—The sum of $500,000 is available for sewer extensions and it is stated that work will be started on the sewers in the near future.

CONTRACTS TO BE LET.

Monrovia, Cal.—Bids will be received on Jan. 7 for furnishing material and constructing a sewer system. C. H. Reed, cy. clk.

Oroville, Cal.—Bids will be received on Jan. 3 for furnishing material and constructing a sewer system, liquefying tanks and sewage disposal works. E. J. Mitchell, cy. clk.

Boston, Mass.—Dec. 6, 12 m. For pipe sewer in Mallon rd. between Rosseter and Bowdoin ave. Surety bond for $600. Louis K. Rourke, supt. of streets, Boston, Mass.

Syracuse, N. Y.—Bids will be received on Jan. 26 for constructing Harbor brook intercepting sewer, etc. G. D. Holmes, chf. engr.

Checotah, Okla.—Bids will be received on Jan. 16 for constructing about 11 mi. of 8, 10 and 12-in. sanitary sewer with manholes, flush tanks, lampholes, disposal plant, etc. Ben Huddleston, cy. clk.

Buffalo, N. Y.—Bids will be received until Jan. 3 for repairing foundations of boilers at the Hamburg sewage pumping plant. Francis G. Ward, chair. bd. of pub. wks.

Masontown, Pa.—Bids will be received until Jan. 16 for constructing sewer and water works systems. C. V. C'oud, chair. borough coun.

Pottsvil'e, Pa.—Bids will be received

on Jan. 17 for constructing water supply, sewage disposal plant, elevator, heating, ventilating, plumbing and electric wiring complete for a building for the insane at Schuylkill Haven, Pa. Charles T. Straughn, cy. contr., Pottsville, Pa.

Aberdeen, S. D.—Bids will be received on Jan. 9 for building 5,600 ft. of 12, 15 and 20-in. pipe sewer extensions, 14 manholes. F. W. Raymond, aud.

Corsicana, Tex.—Bids will be received on Jan. 6, 6 p. m., for constructing 13,200 ft. of additional sewer mains. Certified check 10 per cent. Walter Burgess, cy. secy.

Portage, Wis.—Bids will be received on Jan. 3 for the construction of various sewers. City Council, Portage, Wis.

Buffalo, Wyo.—Bids will be received on Jan. 6 for furnishing labor and material for sewerage system, 24,450 lin. ft. 6 to 15-in. pipe sewer, 51 manholes, 15 flush tanks, 22 lamp holes, outlets, etc. Hayden M. White, cy. clk., Buffalo, Wyo.

Vancouver, B. C.—Bids will be received on Jan. 3 for constructing sanitary sewers in various streets. City Engineer, Vancouver, B. C.

CONTRACTS AWARDED.

Alameda, Cal.—The contract for the construction of sewer in Grant st. between Clinton and Dayton aves. was awarded to Hutchinson Co., 401 14th st., Oakland, Cal.

Fresno, Cal.—The contract for installing main sewer in Belmont annexed territory was awarded to Joe House, Oakland, Cal., $37,000.

Roseville, Cal.—The contract for furnishing material and constructing sewer system was awarded to C. D. Vincent, Oakland, Cal., $42,850.

Ansonia, Conn.—The contract for a sewer system requiring about 6,500 ft. 27, 24 and 18-in. vitrified pipe, 35 manholes and drop manholes, was awarded to O'Neil & Neva, Hartford, Conn., $15,162.

Atlanta, Ga.—The contract for the construction of the Peachtree creek disposal plant has been recommended for award to Chester A. Dady, Brooklyn, N. Y., at $195,563.

Atlanta, Ga.—The following contracts were awarded: Constructing the Peachtree creek and Orme st. intercepting sewer, including about 7 mi. of 48-in. concrete sewer, etc., sec. 4 to Dysard Construction Co., Atlanta, Ga., $35,547; secs. 5, 6, 7, 8, to Nichols Construction Co., Atlanta, Ga., $160,024; construction of Proctor creek sewage disposal plant to Muncipal Engineering & Construction Co., Chattanooga, Tenn., $95,686.

Carlinville, Ill.—The contract for the construction of sewer in the East end of 1st South st. was awarded to Castle Improvement Co., Carlinville, Ill.

Pekin, Ill.—The contracts for the construction of the following sewers: Dist. No. 2, 98 manholes, 131 catchbasins, 250 ft. 12-in. cast iron pipe, 10-in. pipe for catch basin connections; dist. No. 3, 190 manholes, 278 catch basins, 150 ft. 16-in. cast iron pipe, 10-in. pipe for catch basins to Ottawa Construction Co., Ottawa, Ill. John W. Alvord and Chas. B. Burdick, cons. engrs. for the city of Pekin, Ill.

Rock Island, Ill.—The contract for laying sewer and water mains on 6th ave. between 34th and 35th sts. was awarded to P. E. Frenkenschuh.

Indianapolis, Ind.—The contract for laying a sewer in and along the alley of Hiawatha st. from Owosso st. to alley south of New York st. was awarded to Sheehan Construction Co., Indianapolis, Ind.

Kokomo, Ind.—The contract for the installation of 3,000 ft. 15-in. vitrified pipe sewer was awarded to J. H. Watson & Co., Kokomo, Ind.

Sioux City, Ia.—The contract for laying a storm water sewer in Myrtle st. was awarded to W. B. Carter, Sioux City, Ia.

Louisville, Ky.—The contract for the construction of concrete sewer, 7 ft. in diameter in Preston and Fulton sts. was awarded to C. T. McCracken Co., Pittsburg, Pa., $30,978.

Boston, Mass.—The contract for the construction of sewers and catch basins in Western ave. and Lincoln st. was awarded to Chas. J. Jacobs, Boston, Mass.

Flint, Mich.—The contract for the construction of sewer in 12th st. from Harrison to Elm sts. was awarded to Timothy Lynch, 12th st., Flint, Mich.

Kalamazoo, Mich.—The contract for the construction of Fulford st. sewer was awarded to Johnson & Van Dyke, Kalamazoo, Mich., $14,919.

Virginia, Minn.—The contract for constructing storm sewer in 1st ave. and 1st st. was awarded to T. C. Butler, Virginia, Minn., $4,060.

Windsor, Mo.—The contract for the construction of sewer system was awarded to T. C. Brooks & Sons, Jackson, Mich.

Atlantic City, N. J.—The contract for constructing storm water drainage system was awarded to W. G. Root, 20 Broad st., New York, N. Y., $31,000.

Keysport, N. J.—The contract for sewage disposal and pumping works; 41,250 ftt. of 8-in. pipe sewers; 12,335 ft. of 10-in. pipe sewers; 1,310 ft. of 12-in. pipe sewers; 690 ft. of 15-in. pipe sewers; 182 manholes; 4 siphon chambers 10 ft. and under; ¾-in. cast iron pipe to flushing manholes; 6,495 ft. 6-in. cast iron pipe; 375 ft. 12-in. cast iron outfall pipe;; 30 tons cast iron pipe; 10,000,000 ft. lumber; 1 sedimentation and sterilization tank; 1 pump and engine; 1 Cedar st. pump station; 1 Florence ave. pump station; 35 lamp holes; 1,100 ft. cast iron pipe was awarded to Harrison Construction Co., Newark, N. J., $68,463.

New Brunswick, N. J.—The contract for laying a sewer in Richardson st. from Easton ave. to a point near Wycffoff st. was awarded to Farley Bros., New Brunswick, N. J.

Newark, N. J.—The contract for laying storm sewers in ave. C and Dawson st. was awarded to Jersey Paving Co., Union Bldg., Newark, N. J., $5,252.

South Amboy, N. J.—The contract for constructing a portion of sanitary sewer system to include 100 cu. yd. concrete, 30,000 ft. 15, 12, 10 and 8-in. clay pipe sewers, 200 manholes and 20 flush tanks was awarded to Miele Bruno, Newark, N. J., $50,000.

South River, N. J.—The contract for a sewerage system and disposal plant was awarded to Mille & Bruno, Newark, N. J.

New York, N. Y.—The contract for constructing sewer in Monroe ave. was awarded to John E. Donovan, 2205 Richmond Terrace, Port Richmond, N. Y., $7,579.

Charlotte, N. C.—The contract for repairing septic tank was awarded to W. S. Stamill, Charlotte, N. C., $12,510.

Rocky Mountain, N. C.—The contract for the construction of sewage purification plant was awarded to Edwards Construction Co., Hickory, N. C., $5,300.

Fostoria, O.—The contract for laying a sewer in south part of town was awarded to Modern Construction Co., Fremont, O.

Hamilton, O.—The contract for the construction of sanitary sewer at 11th

and Hanover and on Vine st. between 3rd and 4th sts. was awarded to W. H. Louthan, Hamilton, O.

Piqua, O.—The contract for the construction of northwestern sewer was awarded to Backus Construction Co., Dayton, O., $10,000.

Warren, O.—The contract for the construction of sewer system in the northwestern portion of the city was awarded to Dennis & Smith, Warren, O.

Fairfax, Okla.—The contract for the construction of water works and sewer system was awarded to Southwestern Engineering Co., Oklahoma City, Okla.

Yukon, Okla.—The contract for installating sewer system and modern sewage plant was awarded to N. S. Sherman, Jr., Sherman Iron Works, Oklahoma City, Okla., $40,000.

Gresham, Ore.—The contract for the construction of sewer and water systems was awarded to L. C. Kelsey, Portland, Ore.

Watertown, S. D.—The contract for the construction of a sewer was awarded to E. T. Webster, St. Paul, $17,265.

Beeville, Tex.—The contract for constructing a sewer system was awarded to Rees & Peters, San Antonio, Tex.

Brownsville, Tex.—The contract for machinery to complete septic tanks was awarded to Texas Machine & Supply Co., Dallas, Tex.

Dallas, Tex.—The following contracts were awarded: Construction of storm sewer in the regions of River, Nussbaumer and Peak sts. to C. W. Olcott, Dallas, Tex., $14,622; construction of storm sewer to drain the area bounded by Masten, Ross, Central and Live Oak sts. to Dallas Lime & Gravel Co., Dallas, Tex., $19,391.

Fort Worth, Tex.—The contract for the construction of north side sewer was awarded to General Supply & Construction Co., Ft. Worth, Tex., $51,000.

Provo, Utah.—The contract for constructing sewers in sewer dist. No. 11 was awarded to Kennedy Construction Co., Fargo, N. D., $30,000.

Salt Lake, Utah.—The contract for sewer extension 279 on second West st. between S. Temple and E. South sts. was awarded to Dalt L. Pitt, Salt Lake, Utah, $962.50.

North Yakima, Wash.—The contract for laying a sewer in 15th ave. N. W., was awarded to J. L. Stanley, 604 Fairview ave., North Yakima, Wash.

Pasco, Wash.—The contract for constructing sewer system was awarded to Newport Engineering Co., Portland, Ore., $90,000.

Seattle, Wash.—The contract for laying sewers in 15th ave. and other streets was awarded to H. Dahlstrom, 2437 W. 56th st., $6,456.

New Westminster, B. C. The contract for furnishing sewer pipe was awarded to Gilly Bros., New Westminster, B. C.

Vancouver, B. C.—The contract for furnishing vitrified pipe for sewers was awarded to Colin Jackson, Vancouver, B. C.; $3,119.

WATER WORKS.

CONTEMPLATED WORK.

Co'usa, Cal.—The city engineer is preparing plans for water works and sewer system.

Corning, Cal.—Water works and sewer systems to cost about $68,800 are contemplated.

Oceanside, Cal.—Water works improvements to cost $20,000 are contemplated.

Palo Alto, Cal.—The laying of water pipes in Fulton st. between Hamilton and Forest aves. has been ordered.

Porterville, Cal.—Contemplating the expenditure of $75,000 for water main extensions.

Sacramento, Cal.—The city engineer has been authorized to prepare plans for a pump of 15,000,000 gallons capacity to be installed at the water works on Front and I sts.

Temescal (Oakland P. O.), Cal.—The Temescal Water Co. will construct a new pipe line from Temescal to Corona. It will be 8 miles long and of reinforced concrete. H. R. Case is manager.

Tracy, Cal.—Construction of water works system is contemplated.

Oakville, Conn.—Surveys are being made for the construction of water works and sewers.

Dublin, Ga.—Voted $30,000 bonds to improve streets, water and light plants.

Roberta, Ga.—Bids will be received in January for construction of water works and electric light plant for the town of Roberta, Ga. W. J. Marshall, Lizella, Ga.

Rome, Ga.—Voted $75,000 bonds for water works improvements.

Galesburg, Ill.—Voted $75,000 bonds for extension of water system.

Evansville, Ind.—The purchase and installation of a new pump and apparatus to cost about $40,000 is being considered by the water board.

Coffeyville, Kan.—Plans for a gravity filtering system have been prepared.

North Attleboro, Mass.—Electric light and water departments are considering a change in their plant, owing to the increase in the output of electricity and water.

West Bridgewater, Mass.—Water works improvements to the extent of $10.000 are contemplated.

Big Rapids, Mich.—Plans are being prepared for water works system to cost $30,000.

Flint, Mich.—A mechanical filtration plant and extension of the water mains, to cost about $400,000 is contemplated.

Lewistown, Mont.—Rebuilding water works at a cost of about $85,000 is contemplated.

Townsend, Mont.—Plans are being prepared for water works system.

Battle Creek, Neb.—The installation of a water works system is contemplated.

Cortland, Neb.—The installation of an electric light plant and water works system is contemplated.

Lodge Pole, Neb.—Plans are being prepared for the installation of a water works system.

Manchester, N. H.—The construction of a 1,000,000 gallon tank on Rock Remmon, to be used as an emergency reservoir, is being considered by the water biard.

Branchville, N. J.—Plans for an additional reservoir are being prepared.

Bay Shore, L. I., N. Y.—Water works improvements, including new pumping station, pumping engines and boilers are contemplated.

Syracuse, N. Y.—About $50,000 will be expended during the coming year for extending the water works system.

Haines, O.—Construction of water works system is contemplated.

Lakewood, O.—Plans are being prepared for two 500,000-gallon standpipes.

Sugarcreek, O.—Voted $12,500 bonds for water works system.

Sylvania, O.—Plans have been prepared for the construction of a municipal water works system.

Toledo, O.—Increased capacity of the

filtration plant and the establishment of a pure water storage basin at the pumping plant is contemplated.

Wooster, O.—Voted $30,000 bonds to construct water works system.

Duncan, Okla.—Will vote bonds in January to the amount of $45,000 for the construction of a system of sanitary sewers, and for the extension of the present water works system. W. L. Banham, cons. engr., 714-16 Campbell Bldg., Oklahoma City, Okla.

Hood River, Ore.—Water works improvements and extensions are contemplated.

Portland, Ore.—Plans are being prepared for laying water mains in the following streets: E. Yamhill, 21st, 11th, 12th, 13th, 49th, E. Washington, Waverleigh and Park.

Union, Ore.—Plans are being prepared for water works improvement to cost $71,000.

Coraopolis, Pa.—About $22,500 will be expended for improvements to water works and electric light plant.

Somerset, Pa.—Construction of reservoir and water works improvements is contemplated.

Huron, S. D.—Voted $40,000 bonds for construction of water works.

Memphis, Tenn.—The purchase of two 20,000,000-gallon electrical pumps to cost $28,612 is contemplated.

San Augustine, Tex.—Plans have been completed for new water works at an estimated cost of $235,000. R. H. Hall, mayor.

Barre, Vt.—Voted $45,000 bonds for constructing the Orange brook reservoir.

Cambridge, Vt.—The construction of a water works to cost $15,000 is contemplated.

Richmond, Va.—Enlargement and improvement of water mains and system in Washington Ward is contemplated.

Ellensburg, Wash.—Plans have been completed for water works system.

Leavenworth, Wash.—Voted $45,000 bonds for municipal water works system.

Spokane, Wash.—Bids will soon be requested for constructing Lincoln Heights reservoir.

Tacoma, Wash.—Bids will be requested for a steel bridge over Nisqually river, pipe line from tunnel to forebay, 6-acre reservoir; penstock line; power house, machinery, water wheels, generators, transformers and 31 miles of transmission line for Nisqually power project. All items to be included under one bid. Hamilton F. Gronen, engr., city hall, Tacoma, Wash.

Tacoma, Wash.—Bids will soon be asked for the construction of Lincoln Heights reservoir. Estimated cost $129,000.

Madison, Wis.—The city council authorized the issuance of $26,000 bonds for water works improvements.

Prescott, Wis.—Bonds have been voted for a water works system.

Gleichen, Alberta, Can.—Plans are being prepared for water works system to cost about $30,000.

Grand Forks, B. C.—Plans are being prepared for a $10,000 reservoir for the city water works.

CONTRACTS TO BE LET.

Oroville, Cal.—Bids will be received on Jan. 3 for constructing water works and sewer systems. Board of village trustees.

Newton, Ia.—Bids are asked until Jan. 9 for erecting elevated tank. E. G. Finch, cy. clk.

Onoga, Kan.—Bids will be received on Jan. 10 for furnishing material and constructing water works system. Elmer E. Hines, cy. clk.

Stafford, Kan.—Bids will be received on Jan. 3 for furnishing material and constructing a water works and electric light plant. N. P. Reid, cy. clk.

Ft. Smallwood, Md.—Bids wil lbe received on Jan. 10 for constructing pump house and installing pumping machinery. Constr. Q. M., U. S. A., Ft. Howard, Md.

Grand Rapids, Mich.—Bids will be received on Jan. 19 for the construction of filters and equipment. Board of public works, Samuel A. Freshney, secy., Grand Rapids, Mich.

Superior, Neb.—Bids will be received until Jan. 6, 8 p. m., for water works construction. Certified check for $500. J. T. Robbins, cy. clk.

Superior, Neb.—Bids will be received on Jan. 6, 8 p. m., for furnishing material and labor for the equipment and construction of water works. Certified check, $500. J. T. Robbins, cy. clk., Superior, Neb.

Euclid, O.—Bids will be received until Jan. 9 for constructing a 6-in. water main in a portion of Cliffview ave. Nelson J. Brewer, vil. clk.

Masontown, Pa.—Bids will be received until Jan. 16 for constructing sewer and water works systems. C. V. Cloud, chair. borough coun.

Pittsburg, Pa.—Bids will be received on Jan. 11 for furnishing and installing a water power air compressor plant at Lock 1, Monongahela river, Pittsburg, Pa. H. C. Newcomer, Lieut. Col., Pittsburg, Pa.

Pottstown, Pa.—Bids will be received on Jan. 17 for increased water supply, sewage disposal plant, etc. Chas. T. Straughn, co. audr.

Spokane, Wash.—Bids will be received on Jan. 3, 2 p. m., for construction of Lincoln Heights add. concrete reservoir. J. C. Argall, secy., board of pub. wks.

Tacoma, Wash.—Bids will be received on Jan. 6 for 3,600 ft. of 18-in. water pipe to witstand a working pressue of 125 lbs. per sq. Certified check for 10 per cent of bid. John Giord, cy. pur. agt.; Jan. 16, 3. m., furnishing motor-driven combination chemical engine and hose wagon, one motor-driven aerial ladder truck; also auto roadster to carry four persons.

Souris, Man., Can.—Bids will be received on Feb. 1 for furnishing and delivering during the spring and summer of 1911 the following material: about 585 tons of 4 to 12-in. standard cast iron water pipes and special castings; 75 fire hydrants; 45 gate valves, from 4 to 8-in.; 45 cast iron valves boxes; 20,000 lbs. pig lead; 2,000 lbs. oakum; 31,100 ft. of standard vitrified sewer pipe from 8 to 20-in. and specials. J. W. Breakey, secy.

Vancouver, B. C.—Bids will be received on Jan. 11 for furnishing steel pipe, castings, valves and hydrants. H. Floyd, C. M. C., Kerrisdale, B. C.

CONTRACTS AWARDED.

Albertville, Ala.—The contract for the constructing water works system was awarded to H. E. Taylor, Tlanta, Ga.

Adel, Ga.—The contract for water main extensions was awarded to J. B. McCrary Co., Atlanta, Ga., $8,000.

Rock Island, Ill.—The contract for laying water mains and sewer on 6th ave. between 34th and 35th sts. was awarded to P. E. Frenkenschuh.

Burlington, Ia.—The following contracts were awarded for erection of pumping station to Tom McCarthy, Dav-

enport, Ia., $13,000; for pumps and machinery to Erie City Iron Works, Erie, Pa., $14,500.

Indianapolis, Ind.—The contract for a 10,000,000-gallon steam turbine centrifugal pump was awarded to DeLaval Steam Turbine Co., Trenton, N. J.

Stuart, Ia.—The contract for the erection of water tank was awarded to Des Moines Bridge & Iron Co., Des Moines, Ia., $5,248.

Hammond, Ind.—The contract for furnishing 15,000,000-gallon pump to Snow Pump Works. Buffalo, N. Y.

Brunswick, Md.—The contract for furnishing water pipe, hydrants, gate valves, etc., was awarded to Edward S. Moberly & Bros., Frederick. Md.

New Bedford, Mass.—The following contracts were awarded: Furnishing 1,500 tons of 16-in. to 6-in. straight cast iron pipe and 44 tons of special castings to the Standard Cast Iron Pipe & Foundry Co., of Bristol, Pa., for $32,070 and $2,024 respectively. The company bid $21.38 per ton for the cast iron pipe and $46 per ton for specials.

Lawrence, Mass.—The contracts for furnishing quantity of pipe, bell and spigot castings was awarded to Chas. Miller & Sons. Utica, N. Y.

Centerville. Mich.—The contract for furnishing mechanical and pumping equipment for water works and lighting plant, to Young-Gray Co., Toledo, O.; electrical equipment was awarded to F. Bissel Co., 226 Huron st., Toledo, O.

Harbor Springs, Mich.—The contract for furnishing pipe for water works was awarded to J. B. Clow & Sons, Chicago, Ill.

Saginaw, Mich.—The contract for the installation of intake and pump well at east side pumping station was awarded to Wm. N. Sager, Saginaw, Mich., $16,743.

Duluth, Minn.—The contract for repairing intake pipe at Lakewood station was awarded to H. H. Thompson, Duluth, Minn., $6,138.

Fairmont, Minn.—The following contracts were awarded: Installation of a 400-h. p. engine to Minneapolis Steel & Machinery Co., Minneapolis, Minn., $21,985; and for new pump and motor, etc., to Allis Chalmers Co., Minneapolis, Minn., $2,885.

Kenyon, Minn.—The contract for drilling and completing a deep well at the pumping station was awarded to M. Holland, Cannon Falls. Minn.

Minneapolis, Minn.—The contract for two electrically driven 20,000,000-gallon pumps was awarded to Henry R. Worthington, New York, $28,612.

Owatonna, Minn.—The contract for furnishing cross compound Corliss duplex pumping engine, capacity 1,500,000 gallons was awarded to Laidlaw Dunn Gordon Co., New York, $5,993.

Windsor, Mo.—The contract for constructing water works system was awarded to T. C. Brooks & Son, Jackson, Mich., $28,579.

Beatrice, Neb.—The contract for furnishing material and labor for water works improvements was awarded to Mathews Construction Co., Kansas City, Mo., $57,000.

Stratton, Neb.—The contract for the construction of water works system was awarded to Intermountain Bridge & Construction Co., Tecumseh, Neb., $11,000.

East Orange, N. J.—The contract for furnishing 180 tons of 8-in. cast iron pipe and 25 tons of specials was awarded to United States Cast Iron Pipe & Founry Co., New York.

Newark, N. J.—The contract for a new pump pit and subfoundation at the Quindaro pumping station was awarded to A. M. Blodgett Construction Co., Newark, N. J.

Bay Shore, L. I., N. Y.—The contract for pumping station was awarded to John Thatcher & Sons, Brooklyn, N. Y.

Buffalo, N. Y.—The contract for furnishing 3 steam turbine electric generators for new pumping station at foot of Porter ave. was awarded to Westinghouse Machine Co., Pittsburg, Pa.

Poughkeepsie, N. Y.—The contract for furnishing 6 and 8-in. water pipe was awarded to R. D. Wood & Co., Philadelphia, Pa.

Athens, O.—The contract for the construction of water works system at the hospital was awarded Kinnicutt Co., Chicago Heights, Ill., $12,047.

Cincinnati, O.—The contract for furnishing water pipe for the Delhi water connection was awarded to United States Cast Iron Pipe & Foundry Co., Chicago, Ill., $42,369.

Dunkirk, O.—The contract for the constructing water works system was awarded to Nation Co., South Bend, Ind.

West Carrollton, O.—The following contracts were awarded: Pumping station, reservoir, pipe and machinery for water works; reservoir to Ernest Kroemer, 647 Oak st., Dayton, O., $2,216; 2 triplex pumps, 1 motor, 1 gasoline engine to Fairbanks-Morse Co., Cincinnati, O., $3,069; 3,000 ft. of 8-in. pipe to United States Cast Iron Pipe & Foundry Co., Cincinnati, O., $6,675.

West Carrollton, O.—The following contracts were awarded: For 2 triplex pumps, 1 25-h. p. motor and 1 25-h. p. gasoline engine to Fairbanks, Morse & Co., Cincinati, O., $3,079; for pumping station to Ernest Kromer, 647 Oak st., Dayton, O.; for reservoir, laying pipe, etc., to J. Piocher & Son, Miamisburg; for furnishing 8-in. cast iron pipe to United States Cast Iron Pipe & Foundry Co., Cincinnati, O.

Fairfax, Okla.—The contract for the construction of water works and sewer system was awarded to Southwestern Engineering Co., Oklahoma City, Okla., $50,000.

Stigler, Okla.—The contract for the construction of water works, including river dam and watershed, was awarded to Healy Construction Co., McAlester, Okla., $26,700.

Stilwell, Okla.—The contract for constructing new water works was awarded to Southwestern Engineering Co., Oklahoma City, Okla., $45,000.

Gresham, Ore.—The contract for the construction of sewer and water systems was awarded to L. C. Kelsey, Portland, Ore.

Medford, Ore.—The contract for constructing new water works system was awarded to James A. Maer, Portland, Ore.

Jacksonville, Ore.—The contract for the installation of water works system was awarded to James J. Means, Portland, Ore.

Sagertown, Pa.—The following contracts were awarded; for constructing reservoir and laying pipe for water works system to Henry Knipple, Olean, N. Y.;

for pipe and special castings to United States Cast Iron Pipe & Foundry Co., Buffalo, N. Y.; for hydrants and valves to Kennedy Valve Mfg. Co., Elmira, N. Y.

Fort Greble, R. I.—The contract for the construction of a 1,000,000-gallon reinforced concrete reservoir was awarded to Simpson Bros. Corporation, 166 Devonshire st., Boston, Mass., $28,028.

Timmonsville, S. C.—The following contracts were awarded. General water works construction to Abee & Hart, Hickory, N. C., $26,393; wells to Hughes Specialty Well Drilling Co., Charleston, S. C., $1,496; a 100-h. p. boiler and a steel tank and tower to R. D. Cole & Co., Atlanta, Ga., $5,610; valves and hydrants to Columbia Iron Works, Chattanooga, Tenn., $1,655; and general service pumps to Platte Iron Works, Atlanta, Ga., $1,185.

Belle Fourche, S. D.—The contract for water works, a 30,000 and a 200,000-gallon reinforced concrete reservoir, pumping station; air compressor; air receiver; air lines to wells; 20-h. p. motor for compressor! triplex power pump with motor; wiring, switches, lighting circuit; 18,815 ft. cast iron pipe from 4 to 10 in; 6 and 8-in. cutoff valves; 12 hydrants; special castings; 970 ft. of 4 and 6-in. cast iron pipe, was awarded to Kat-Craig Construction Co., Omaha, Neb., 31,935; the contract for furnishing cast iron pipe, beams and grillage bars for the Belle Fourche project was awarded to Marshall Foundry Co., Pittsburg, Pa., $7,697.

Denison, Tex.—The contracts for water works materials were awarded as follows: pipe to United States Cast Iron Pipe & Foundry Co., Chattanooga, Tenn.; valves to R. D. Wood & Co., Philadelphia, Pa.; lead and jute to Hardwick Etter, Denison, Tex.; total cost $28,000.

Denison, Tex.—The contract for an engine and pump was awarded to Briggs-Weaver Machinery Co., Dallas, Tex., $11,740.

North Yakima, Wash.—The contract for the construction of about 40 miles of laterals in connection with Yakima irrigation project was awarded to Nelson Rich, Prosser, Wash., $116,070.

Spokane, Wash.—The contract for laying water mains in dist. No. 501 was awarded to Gallucii & De Rose, 1404 S. 13th st., $13,219.

Winnipeg, Man., Can.—The following contracts were awarded for furnishing materials for domestic water works; water pipe to Canada Iron Corporation, Montreal, Que., $47,538; valves to McAvity & Sons, St. John, N. B., $3,523; hydrants to Canadian Fairbanks Co., Winnipeg, Man., $37 each.

Montreal, Que., Can.—The contract for furnishing motor driven centrifugal pump of 5,000,000 gallons capacity. It consists of a 16-in. two-stage tuhbine pump, driven by an Allis-Chalmers-Bullock 500 h. p. rotor wound motor was awarded to John McDougal, Caledonia Works Co., Montreal, Que., Can.; $7,716.

BRIDGES.

CONTEMPLATED WORK.

Bridgeport, Conn.—Construction of a bridge on E. Washington ave. is contemplated.

Hartford, Conn.—Construction of a bridge connecting Riverside st. with Pope Park is contemplated.

Fernandina, Fla.—The construction of a bridge across the Nassau river and marsh is contemplated.

Jacksonville, Fla.—A bridge over St. John river to connect with South Jacksonville is contemplated.

Covington, Ky.—A bridge at Willow st. to cost $20,000 is contemplated.

Lagrange, Ind.—The construction of bridges over the new Fly creek is contemplated.

Laporte, Ind.—The construction of steel and concrete bridges is being considered by the board of county commissioners.

Fitchburg, Mass.—The erection of a $100,000 bridge and highway to connect Water and Summer sts. sections is contemplated.

Kalispell, Mont.—Construction of five new bridges is contemplated.

Kansas City, Mo.—A reinforced concrete bridge over Blue river at 15th st. and a viaduct on 12th st. to cost $1,400,000 are contemplated.

Bloomington, Neb.—The contract for constructing a steel bridge over Republican river, near Reverton will be let soon.

Franklin, Neb.—Bids will soon be requested for the construction of a steel bridge across the Republican river east of Reverton.

New Brunswick, N. J.—The Middlesex county board of freeholders are having plans prepared for a lift bridge over Cheesequake creek. Plans are being prepared for a reinforced concrete bridge at Roosevelt. Fred F. Simons, co. engr.

Black River, N. Y.—Construction of a concrete and steel bridge 18 ft. wide and 172 ft. span across Black river is contemplated.

Salamanca, N. Y.—Construction of a concrete bridge to span Alleghany river at Main st. is contemplated.

Drayton, N. D.—A bridge across Red river to cost $50,000 is contemplated.

Brilliant, O.—The construction of a bridge over the Ohio river near Brilliant is contemplated.

Haskell, Okla.—Plans are being prepared for a bridge over Arkansas river at Haskell.

Muskogee, Okla.—Voted $150,000 bonds for construction of 33 new bridges.

Brady, Tex.—Bonds have been voted for construction of two bridges across the Colorado river.

Knoxville, Tenn.—The construction of a new bridge across the Southern railroad tracks on Gay st. is contemplated.

Coleman, Tex.—The construction of two bridges over Colorado river, one at Waldrop to cost $15,896, and the other at Stacy to cost $21,484, are contemplated.

Cuero, Tex.—The contract for rebuilding Clear creek bridge was awarded to C. H. Horton, Austin, Tex. $12,095.

Nacogdoches, Tex.—Two concrete bridges, one over the Bonita creek and the other on S. Fredonia st., are contemplated.

Lynchburg, Va.—Plans are being prepared for a bridge over James river at Lynchburg, Va. Estimated cost $200,000.

North Yakima, Wash.—The construction of a bridge to span the Kuskilana river is contemplated.

Spokane, Wash.—Plans have been approved for the construction of a concrete bridge over Latah creek at a cost of $425,000.

CONTRACTS TO BE LET.

Piggott, Ark.—Bids will be received on Jan. 5 for the construction of a bridge over Black river. B. B. Holifield, Rector, Ark., co. judge.

East St. Louis, Ill.—Bids will be received on Jan. 9 for the construction of four highway bridges over Cahokia creek, Division channel, Madison Co., Ill. Board of trustees, East St. Louis, Ill.

Edwardsport, Ind.—Bids will be received on Jan. 5 for constructing steel bridge with reinforced concrete piers across White river at this place. Cost about $18,000. J. P. Scott, audr. Knox Co., Vincennes, Ind.

Vincennes, Ind.—Bids will be received on Jan. 5, 10 a. m., for constructing a bridge over White river. John T. Scott, audr. Knox Co.

Marshalltown, Ia.—Bids will be received on Jan. 4, 12 m., for the construction of three reinforced concrete bridges. 10 per cent certified check. County Auditor, Marshalltown, Ia.

New Hampton, Ia.—Bids will be received on Jan. 5 for the construction of several reinforced concrete bridges. Board of County Supervisors.

Mexico, Mo.—Bids will be received until Jan. 2 for constructing a 126-ft. span steel bridge with concrete abutments and wooden floor. E. H. Carter, co. clk.

Geneva, Neb.—Bids will be received on Jan. 10, 12 m., for furnishing material and constructing all county bridges. Certified check $500. Uriah F. Standard, cy. clk.

York, Neb.—Bids will be received on Jan. 10, for the construction of steel and wooden bridges that may be built in the county during the coming year. Certified check for $500. H. F. Chapin, co. clk., York, Neb.

Ashland, O.—Bids will be received on Jan. 2, 12 m., for the erection of Race street arch. William Shider, chr. co. com.

Cincinnati, O.—Bids will be received on Jan. 13 for the construction of concrete bridge on Cooper ave. in Lockland, Springfield, tp.; $2,000 bond required. Fred Dreihs, clk.

Portland, Ore.—Bids will be received on Jan. 2 for the construction of superstructure of Broadway bridge. City Clerk, Portland, Ore.

Wessington Springs, S. D.—Bids will be received on Jan. 7 for furnishing material and constructing 8 combination steel and concrete bridges. H. O. Refvem, audr.

Richmond, Va.—Bids will be received on Feb. 1 for the construction of a reinforced concrete bridge over James river. Certified check for $5,000. Chas. E. Bolling, cy. engr., Richmond, Va.

CONTRACTS AWARDED.

Anniston, Ala.—The following contracts were awarded: Concrete bridge over Morrisonville road, to Fred Laudt, Anniston, Ala.; and concrete bridge over Cornhouse creek to N. F. Morris, Anniston, Ala.

Cullman, Ala.—The contract for the construction of a 4-deck girder bridge, consisting of 7 80-ft. spans, 1 60-ft. span, and 2 90-ft. spans, 2 half through bridges of 80-ft. spans and 1 60-ft. span, was awarded to Virginia Bridge & Iron Co., Roanoke, Va.

Madera, Cal.—The contract for the construction of bridge over Cottonwood creek was awarded to Pacific Construction Co., 16 California st., San Francisco, Cal.

Santa Ana, Cal.—The contract for constructing bridge across W. 4th st. channel was awarded to A. E. Bird, Santa Ana, Cal.

Ukiah, Cal.—Tre contract for the construction of a 460-ft. bridge over Russian Gulch was awarded to Mervey-Elwell Co., East Oakland, Cal., $7,340.

Visalia, Cal.—The contract for the construction of a reinforced concrete bridge 70 ft. long across Mill creek was awarded to Oscar Parlier, Tulare, Cal.

Delta, Col.—The contract for the construction of a state bridge 2½ miles west of the city was awarded to Pueblo Bridge Co., Pueblo, Col., $11,500.

Miami, Fla.—The contract for constructing two bridges, one over Snake creek and the other over Little river, was awarded to Champion Bridge Co., Wilmington, O.

Douglasville, Ga.—Voted $20,000 bonds for construction of water works.

Chicago, Ill.—The contract for repairing of the Clark st. bridge over the Chicago river was awarded to Strobel Steel Construction Co., 98 Jackson blvd., Chicago, Ill.

Joliet, Ill.—The contract for the construction of two new bridges in Radnor and Logan tps. was awarded to Joliet Bridge Co., Joliet, Ill., $1,674.

Peoria, Ill.—The contract for constructing two bridges in Radnor and Logan tps. was awarded to Joliet Bridge Co., Joliet, Ill., $3,848.

Lebanon, Ind.—The contract for repairing Prairie creek bridge at Thorntown was awarded to Earl Sparks, Kirklin, Ind., $1,097.

Paoli, Ind.—The contract for constructing a concrete bridge at Paoli, Ind., was awarded to International Steel & Iron Construction Co., Evansville, Ind., $2,662.

Burlingame, Kan.—Concrete arch over Switzer creek was awarded to Topeka Bridge & Iron Co., Topeka, Kan., $2,145.

Leavenworth, Kan.—The following contracts were awarded: Two bridges in High Prairie tp. to J. W. Orr, Leavenworth, Kan.; building the Fletcher bridge to Leavenworth Bridge Co., Leavenworth, Kan., and the Wheat bridge to J. B. Tierny, Leavenworth, Kan.

Rozel, Kan.—The contract for the construction of reinforced concrete arch bridge over Pawnee river was awarded to Topeka Bridge & Iron Co., Topeka, Kan., $5,365.

Harlan, Ky.—The contract for constructing steel bridge over Clover Fork was awarded to F. F. Cawood, Harlan, Ky., $13,750.

Saginaw, Mich.—The contract for the construction of a bridge in Brant tp. was awarded to Joliet Bridge & Iron Co., Joliet, Ill.

Columbia, Mo.—The contract for the construction of steel bridges was awarded to Missouri Bridge & Iron Co., St. Louis, Mo., $21,000.

Galena, Mo.—The contract for a bridge across the James river at Galena was awarded to Western Bridge Co., Kansas City, Mo., $12,000.

Lincoln, Neb.—The contract for the steel work for all bridges to be erected in the county the coming year was awarded to Ward Bridge Co., Tecumseh, Neb.

New York, N. Y.—The contract for constructing the painting platforms and runways for the Manhattan bridge between Manhattan and Brooklyn was awarded to Vulcan Rail & Construction Co., 175 N. 9th st., Brooklyn, N. Y.

New York, N. Y.—The contract for repairs to 3 bridges in Forest Park was awarded to Joseph Casey, 136 Liberty st., New York, N. Y., $1,298.

Cincinnati, O.—Plans have been prepared for a concrete and steel bridge 900 ft. long and 6 ft. roadway to be constructed at Gilbert ave. Estimated cost $750,000.

Lima, O.—The contract for the construction of Geiger bridge in Sugar creek tp. was awarded to Engineering Construction Co., Canton, O.

Miami, O.—The contract for the construction of two iron bridges over Snake creek and Little river was awarded to Champion Bridge Co., Wilmington, O.

Oklahoma City, Okla.—The contract for constructing a reinforced concrete bridge over Canadian river was awarded to Topeka Bridge & Iron Co., Topeka, Kan.

Allentown, Pa.—The contract for widening Hamilton st. bridge was awarded to Stewart Contracting Co., Easton, Pa., $19,750.

Rock Hill, S. C.—The contract for an iron bridge over Catawba river between York and Lancaster counties was awarded to Roanoke Bridge Co., Roanoke, Va., $17,800.

Cuero, Tex.—The contract for rebuilding the bridge over Clear creek was awarded to C. H. Horton, Austin, Tex., $12,095.

Dallas, Tex.—The contract for the construction of Oak Cliff terminal of the Dallas-Oak Cliff viaduct was awarded to H. H. Yorty, Ft. Worth, Tex., $15,970.

Waco, Tex.—The contract for the construction of new bridges at 8th st. over Waco creek and at 4th over the same stream was awarded to Austin Bros., Dallas, Tex.

Madison, Va.—The contract for three steel bridges in Madison Co. was awarded to Roanoke Bridge Co., Roanoke, Va., $3,842.

Petersburg, Va.—The contract for the construction of superstructure of viaduct over valley of Lieutenant run at Petersburg, Va. was awarded to Roanoke Bridge & Iron Co., Richmond, Va., $50,000.

Centralia, Wash.—The contract for the construction of 4 steel bridges was awarded to Coast Bridge Co., Portland, Ore.

Ritzville, Wash.—The contract for three bridges in western part of the county was awarded to Coast Bridge Co., Portland Ore., $7,723.

Seattle, Wash.—The following contracts were awarded: Construction of a bridge at Entiat over Entiat river to Gerrick & Gerrick, Seattle , Wash., and a drawbridge across Spokane ave. to International Contract Co., Central Bldg., Seattle, Wash., $30,044.

Spokane, Wash.—The contract for the installation of steel work across the North Coast Ry. bridge spanning Hangman creek and the Spokane river was awarded to Missouri Bridge & Iron Works, Leavenworth, Kan.

Wheeling, W. Va.—The contract for the erection of concrete bridge to span Woods run was awarded to L. G. Hallock & Sons, Wheeling, W. Va., $3,200.

STREET LIGHTING.

CONTEMPLATED WORK.

Lodi, Cal.—New bids will soon be requested for installation of an electric light plant, former bids having been rejected.

Loyalton, Cal.—Installation of an electric light system is contemplated.

Piedmont, Cal.—Installation of a municipal electric light plant is contemplated.

Richmond, Cal.—A modern electric lighting system is contemplated.

San Bernardino, Cal.—Construction of an electric light plant is contemplated.

Dublin, Ga.—Voted $30,000 bonds to improve light and water plants and streets.

Roberta, Ga.—Bids will be received about January for construction of water works and electric light plant for the town of Roberta, Ga. W. J. Marshall, Lizella, Ga.

McDonough, Ga.—Municipal light plant is contemplated.

Brazil, Ind.—The construction of a municipal light and power plant is contemplated.

Colfax, Ind.—The installation of municipal electric light plant is contemplated.

Yorktown, Ind.—Installation of lighting system is contemplated.

Atlantic, Ia.—Voted $50,000 bonds for a new lighting plant and consolidating it with the municipal water plant.

Coggan, Ia.—The installation of a municipal electric light plant is contemplated.

Stafford, Ia.—Voted $25,000 bonds to purchase an electric light plant.

Horton, Kan.—Contemplating the installation of an electric light plant, and desirous of learning the approximate cost of installing a plant for a town of 4,000. B. F. Norris, cy. clk.

Fort Scott, Kan.—Installation of modern street lighting system is contemplated.

Sandusky, Mich.—Installation of an electric light plant is contemplated.

Foley, Minn.—The installation of an electric light plant is contemplated.

Thief River Falls, Minn.—An electric light and power plant will be installed in the spring.

Ansley, Neb.—Municipal electric light plant is contemplated.

Cortland, Neb.—The installation of an electric light plant and water works system is contemplated.

Wymore, Neb.—Voted bonds for an electric light plant.

Newark, N. J.—The question of running a municipal electric light plant is being considered.

Gloversville, N. Y.—Construction of an electric light plant is contemplated.

Silver Springs, N. Y.—The installation of a combined electric light and pumping plant is contemplated.

Warrenton N. C.—A municipal light plant is contemplated.

Union, Ore.—Municipal lighting plant is contemplated.

Bryant, S. D.—The business men have contributed $3,000 toward the construction of a municipal lighting system.

Letcher, S. D.—The installation of an electric light plant is contemplated.

Metaline, Wash.—An electric plant will be installed to generate power for the operation of its water pumping plant.

Seattle, Wash.—Voted $1,400,000 bonds for enlarging and extending the electric light plant.

Spokane, Wash.—A $5,000,000 municipal power plant is contemplated.

Maiden Rock, Wis.—A municipal electric light system is contemplated.

Lovell, Wyo.—Voted $7,000 bonds for installation of an electric light plant.

North Toronto, Ont., Can.—An electrical plant for lighting the streets and residences is contemplated.

CONTRACTS TO BE LET.

Stafford, Kan.—Bids will be received on Jan. 3 for furnishing material and constructing a water works and electric light plant. N. P. Reid, cy. clk.

CONTRACTS AWARDED.

Fairfield, Conn.—The contract for city lighting was awarded to American Street Lighting Co., Fairfield, Conn.

Plainville, Conn.—The contract for street lighting for a period of five years

was awarded to Housatonic Power Co., Plainville, Conn.

Cairo, Ga.—The contract for improvements to municipal electric light plant was awarded to J. B. McCrary & Co., Atlanta, Ga.

Allentown, N. J.—The contract for the erection of municipal electric plant was awarded to Adams Electric Co., Trenton, N. J., $40,000.

Warren, O.—The contract for street lighting for 10 years was awarded to Warren Water & Light Co., 114 E. Market st., Warren, O.

Neodesha, Okla.—The contract for the installation of municipal electric light plant was awarded to Square Electric Co., Kansas City, Mo., $11,800.

Howard, S. C.—The contract for the installation of electric light plant was awarded to Harry Lyon, Sioux City, Ia.

Rock Hill, S. C.—The following contracts were awarded: Municipal light plant: for generators and supplies to Westinghouse Co., Pittsburg, Pa.; for poles to Mill Supply Co., Charlotte S. C.; for wire and cross arms to Southern Electric Co., Baltimore, Md.

Occoquan, Va.—The contract for furnishing and installing a complete electric lighting plant was awarded to National Electrical Supply Co., 1330 New York ave., Washington, D. C.

FIRE APPARATUS.

CONTEMPLATED WORK.

Oakland, Cal.—$55,000 has been appropriated for 3 auto combination hose wagons, an auto pumping engine, 2 steamers, hose, hose wagon, horses, etc.

Denver, Col.—The purchase of auto fire apparatus is contemplated.

New Haven, Conn.—The purchase of a chemical engine is contemplated.

Jacksonville, Fla.—The purchase of an additional combination hose wagon for station No. 3 is contemplated.

Chicago, Ill.—The purchase of 25 fire engines is contemplated.

Oakley, Ky.—Fire Chief Fred Schmidt has recommended the purchase of 500 ft. of fire hose.

Monroe, La.—Contemplating the purchase of chemical engine, hose and hose wagon.

Lynn, Mass.—Contemplating the purchase of a motor-driven combination chemical wagon.

Springfield, Mass.—The town of Merrick is considering the purchase of an auto fire engine.

Highland Park, Mich.—Bids will be asked for an auto engine, hose wagon and chemical truck. Fire Marshal Malcom E. Lawrence, Highland Park, Mich.

Rochester, Minn.—The purchase of a chemical fire engine is contemplated.

Hackensack, N. J.—The purchase of an auto chemical is contemplated.

Rochester, N. Y.—Will buy two chemical tanks and 5,000 ft. of hose.

Akron, O.—Will buy an auto combination chemical. Address Chief Mertz.

Weston, O.—Contemplating the purchase of new fire apparatus.

Rexmont, Pa.—Contemplating the purchase of a chemical engine.

Edgewood, R. I.—The purchase of an auto truck is contemplated.

Richmond, Va.—Contemplating the purchase of an auto fire engine.

Tacoma, Wash.—The purchase of an automobile hose and chemical wagon and an automobile ladder truck is contemplated.

CONTRACTS TO BE LET.

Missoula, Mont.—Bids will be received Jan. 9 for a 6-cylinder auto-propelled combination chemical engine and hose wagon from 60 to 80 horse power. City Clerk.

Lakewood, O.— Bids are requested for fire apparatus. C. M. Cook, cy. clk.

Tacoma, Wash.—Bids will be received on Jan. 16, 3 p. m., for furnishing motor driven combination chemical engine and hose wagon, one motor driven aerial ladder truck; also auto roadster to carry four persons.

CONTRACTS AWARDED.

Freeport, Ill.—The following contracts were awarded: Combination hose and chemical wagon with 40-gallon chemical cylinder to Seagrave Co., Columbus, O.; 1,000 ft. of fire hose to Voorhees Rubber Co., Chicago, Ill.

Wahpeton, N. D.—The contract for furnishing 500 ft. of fire hose was awarded to S. N. Knott & Co., Minneapolis, Minn.

GARBAGE DISPOSAL, STREET CLEANING AND SPRINKLING.

CONTEMPLATED WORK.

Alameda, Cal.—The board of health has recommended that a garbage crematory be established in this city.

Santa Cruz, Cal.—Bids will soon be asked for construction of municipal incinerating plant.

Bridgeport, Conn.—The purchase of two street flushing machines is contemplated.

Waterbury, Conn.—Board of health is considering the building of a new garbage disposal plant.

Chicago, Ill.—Installation of a garbage incinerator at the Bridewell is contemplated.

Kansas City, Mo.—Plans will be prepared for three garbage disposal plants.

Omaha, Neb.—Contemplating the expenditure of about $100,000 for a plant to generate from burning garbage enough power to light the streets and furnish heat for public buildings.

Rochester, N. Y.—The construction of a garbage crematory to cost $100,000 is contemplated.

Nashville, Tenn.—Installation of garbage incinerator is contemplated.

Marlin, Tex.—The construction of a garbage crematory is contemplated.

Temple, Tex.—A crematory for the reduction of all municipal garbage, etc., to cost between $5,000 and $10,000 is contemplated.

Benwood, W. Va.—Crematory site has been purchased; the plant will be about 10-ton capacity.

CONTRACTS TO BE LET.

Cumberland, Md.—Bids will be received on Jan. 3, 3 p. m., for collecting and disposing of garbage, ashes, etc. Ward M. Eichelberger.

CONTRACTS AWARDED.

San Francisco, Cal.—The contract for constructing municipal incinerator plants was awarded to Destructor Co., San Francisco, Cal., $255,216.

New Albany, Ind.—The contract for collecting garbage from streets for one year was awarded to W. H. Newhouse, New Albany, Ind.

Boston, Mass.—The contract for removing snow in dist. No. 3 was awarded to Mark L. Lynch, Boston, Mass.